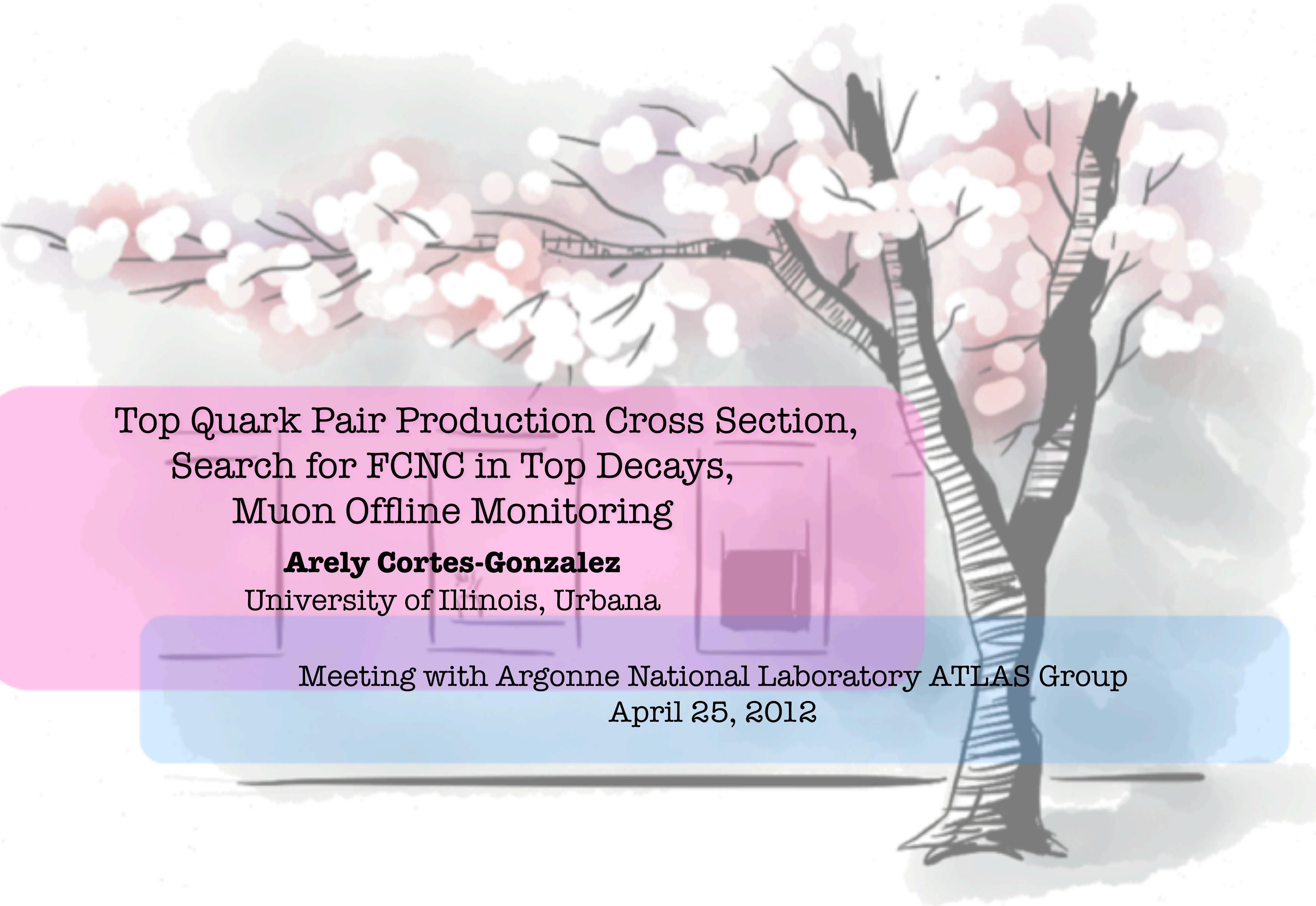
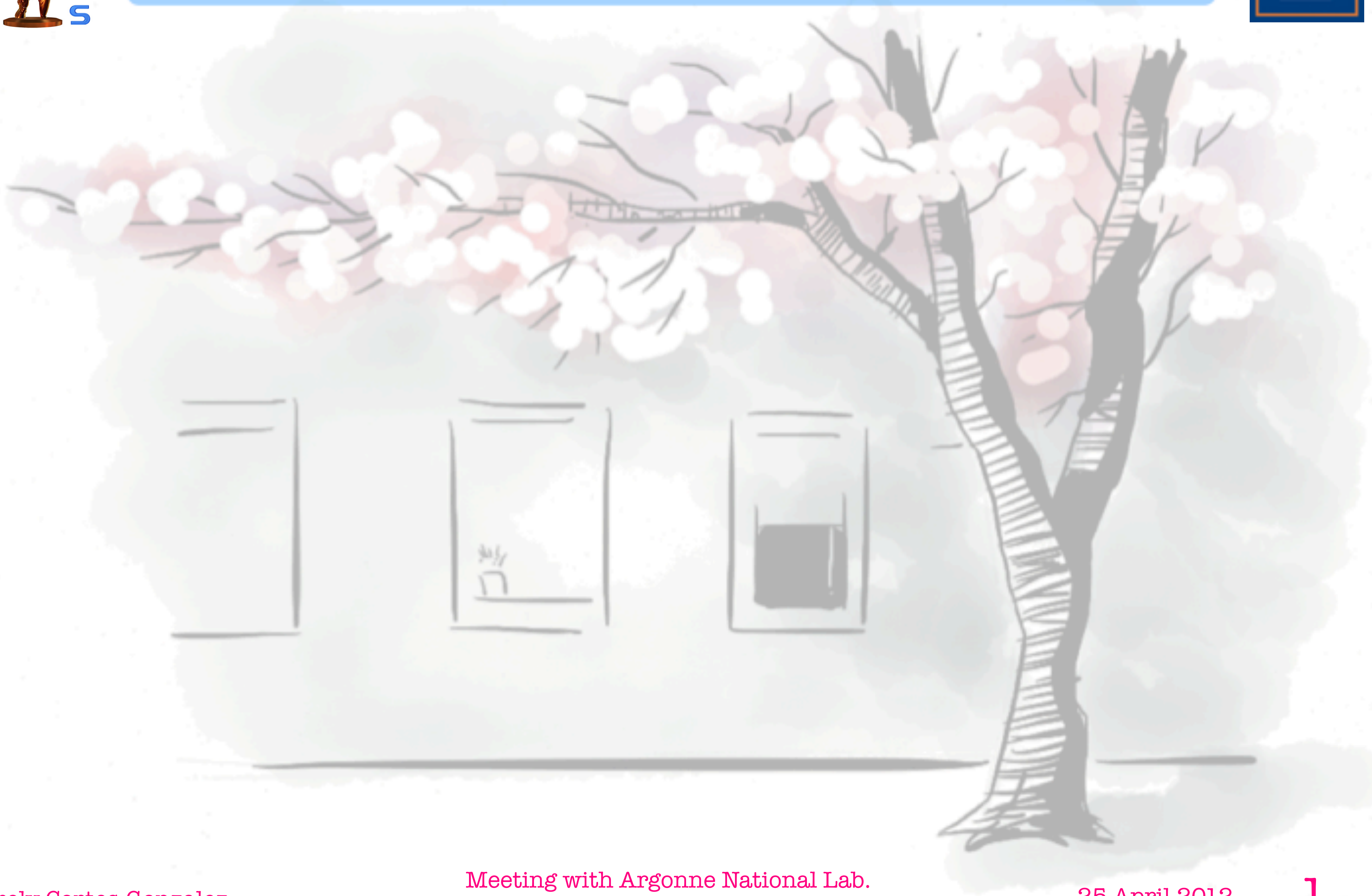


Top Quark Pair Production Cross Section, Search for FCNC in Top Decays, Muon Offline Monitoring

Arely Cortes-Gonzalez
University of Illinois, Urbana

Meeting with Argonne National Laboratory ATLAS Group
April 25, 2012

Outline



Outline

Service Work

Working on the offline Muon Monitoring effort of the University of Illinois

Outline

Service Work

Working on the offline Muon Monitoring effort of the University of Illinois

Physics Analysis In Top-Physics Group

Fake backgrounds in the production cross-section measurement of t-tbar.

Outline

Service Work

Working on the offline Muon Monitoring effort of the University of Illinois

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Fake backgrounds in the production cross-section measurement of t-tbar. Search for flavor changing neutral currents in top-quark decays.

Outline

Service Work

Working on the offline Muon Monitoring effort of the University of Illinois

Physics Analysis In Top-Physics Group

Fake backgrounds in the production cross-section measurement of t-tbar.
Search for flavor changing neutral currents in top-quark decays.

Plans

(very loose)
Work plan proposal

Muon Offline Monitoring

I have worked in the development of the infrastructure of the **offline** muon DQ monitoring, since its very early stages.

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Muon Raw Data

Muon Segments

Muon Tracks

Muon Physics

Muon Offline Monitoring

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Muon Raw Data | Muon Segments | Muon Tracks | Muon Physics

Mainly in muon track monitoring

Study stand-alone tracks by monitoring reconstructed quantities: hit multiplicity, hit residuals, track χ^2, etc.

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Muon Raw Data | Muon Segments | Muon Tracks | Muon Physics

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Study stand-alone tracks by monitoring reconstructed quantities: hit multiplicity, hit residuals, track χ^2, etc.

It also works as a probe for calibration and alignment constants, and hardware performance.

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Muon Raw Data | Muon Segments | Muon Tracks | Muon Physics

Mainly in muon track monitoring

Study stand-alone tracks by monitoring reconstructed quantities: hit multiplicity, hit residuals, track χ^2, etc.

It also works as a probe for calibration and alignment constants, and hardware performance.

Also made smaller contributions to detector and segment level.

Muon Offline Monitoring

Main duties:

Code development & maintenance

Manager of the MuonTrackMonitoring package running at Tier0 for the histogram production

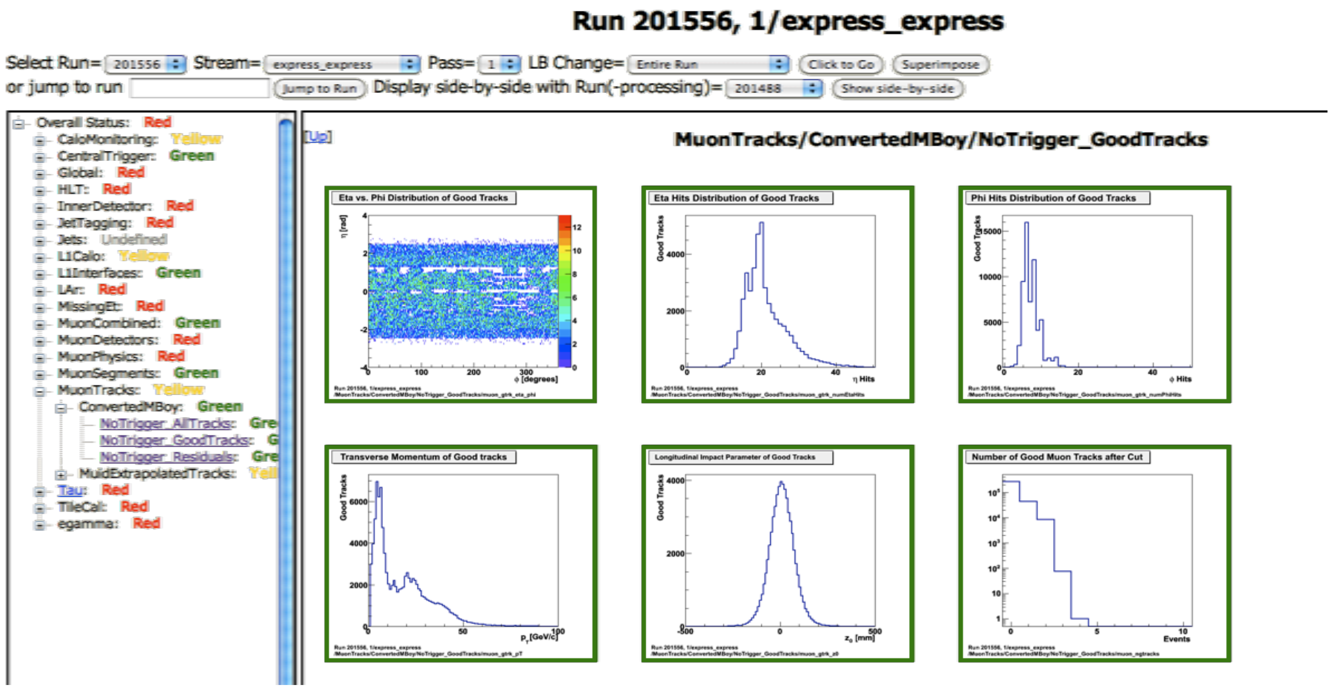
Duties @ Muon Offline Monitoring

Code development & maintenance

MuonT
at Tie

Web Display

Selection of histograms to be checked by the shifter.
Implementation of algorithms for automatic flagging of histograms.



Duties @ Muon Offline Monitoring

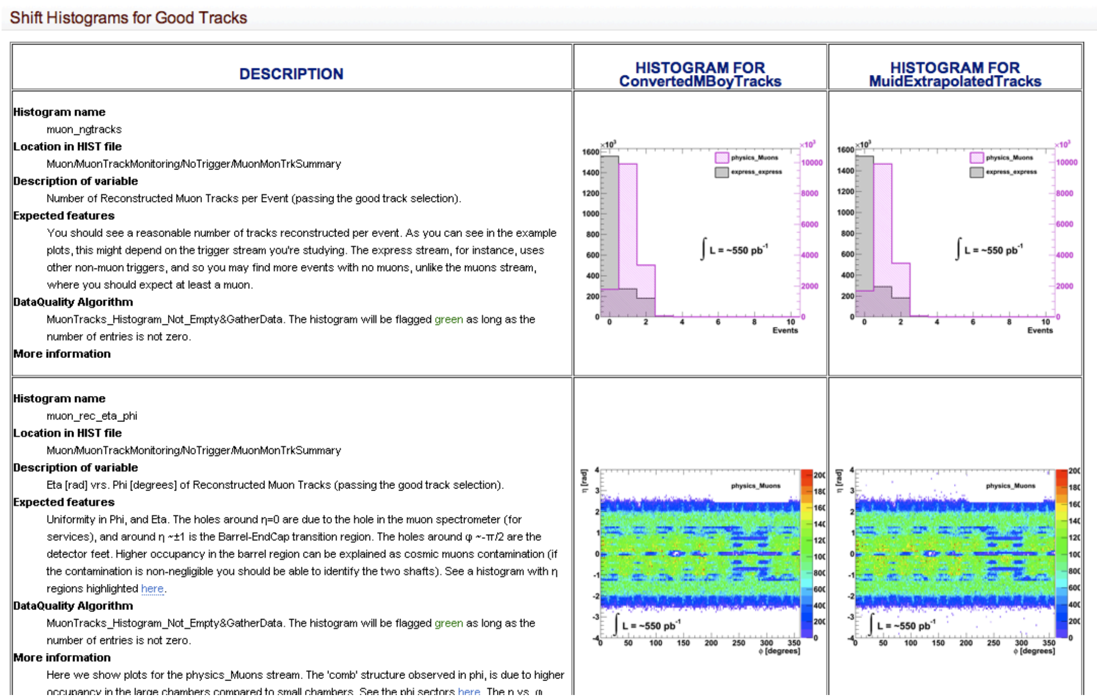
Code development & maintenance

MuonT
at Tie

Documentation, Tutorials & Offline Coordination

Maintain & update the documentation for shifters.

https://twiki.cern.ch/twiki/bin/viewauth/Atlas/MuonTrackOfflineMonitoringPlots


Shift Histograms for Good Tracks

DESCRIPTION	HISTOGRAM FOR ConvertedMBoyTracks	HISTOGRAM FOR MuidExtrapolatedTracks
Histogram name muon_ngtracks **Location in HIST file** Muon/MuonTrackMonitoring/NoTrigger/MuonMonTrkSummary **Description of variable** Number of Reconstructed Muon Tracks per Event (passing the good track selection). **Expected features** You should see a reasonable number of tracks reconstructed per event. As you can see in the example plots, this might depend on the trigger stream you're studying. The express stream, for instance, uses other non-muon triggers, and so you may find more events with no muons, unlike the muons stream, where you should expect at least a muon. **DataQuality Algorithm** MuonTracks_Histogram_Not_Empty&GatherData. The histogram will be flagged green as long as the number of entries is not zero. **More information**		
Histogram name muon_rec_eta_phi **Location in HIST file** Muon/MuonTrackMonitoring/NoTrigger/MuonMonTrkSummary **Description of variable** Eta [rad] vrs. Phi [degrees] of Reconstructed Muon Tracks (passing the good track selection). **Expected features** Uniformity in Phi, and Eta. The holes around η=0 are due to the hole in the muon spectrometer (for services), and around η ~±1 is the Barrel-EndCap transition region. The holes around φ ~-π/2 are the detector feet. Higher occupancy in the barrel region can be explained as cosmic muons contamination (if the contamination is non-negligible you should be able to identify the two shafts). See a histogram with η regions highlighted here. **DataQuality Algorithm** MuonTracks_Histogram_Not_Empty&GatherData. The histogram will be flagged green as long as the number of entries is not zero. **More information** Here we show plots for the physics_Muons stream. The 'comb' structure observed in phi, is due to higher occupancy in the large chambers compared to small chambers. See the phi sectors here. The η vs. φ		

Duties @ Muon Offline Monitoring

Code development & maintenance

MuonT
at Tie

Documentation, Tutorials & Offline Coordination

Maintain & update the documentation for shifters.

A few tutorials given in workshops organized by the Muon Group.
https://indico.cern.ch/conferenceDisplay.py?confId=103772

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Author of the Track Monitoring section of the INT note written to document the early work done on the offline monitoring.
https://cdsweb.cern.ch/record/1333085

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As of the end of last year, I was one of the Muon Operation Coordinators.

Duties @ Muon Offline Monitoring

Code development & maintenance

MuonT
at Tie

Web Display

Selection of his

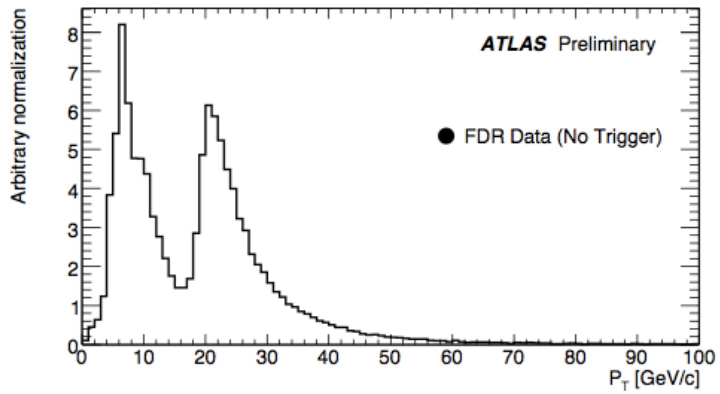
Implementa
automatic f

Documentation, Tutorials & Offline Coordination

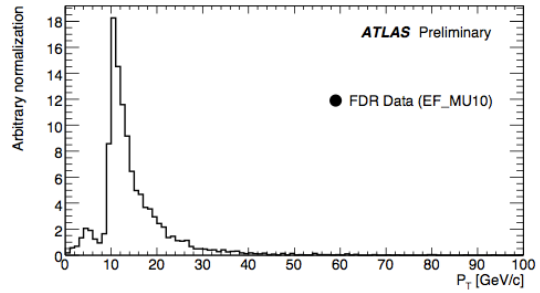
Maintain & update the documentation for shifters.
A few tutorials given in workshops organized by the Muon Group.
Muon Operation Coordinators.

Examples of Muon Offline Monitoring

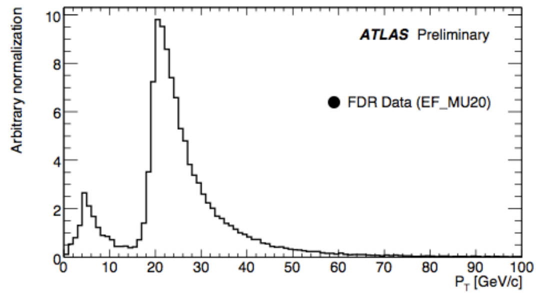
Implementation of Trigger Aware Monitoring



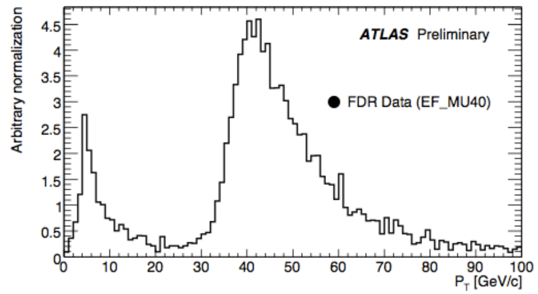
(a) No Trigger



(b) EF_MU10



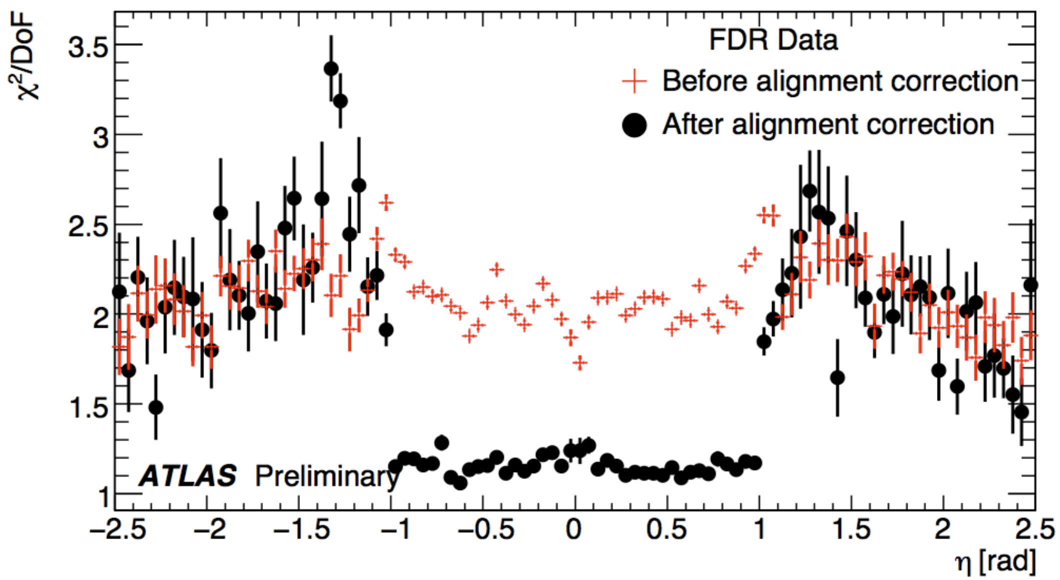
(c) EF_MU20



(d) EF_MU40

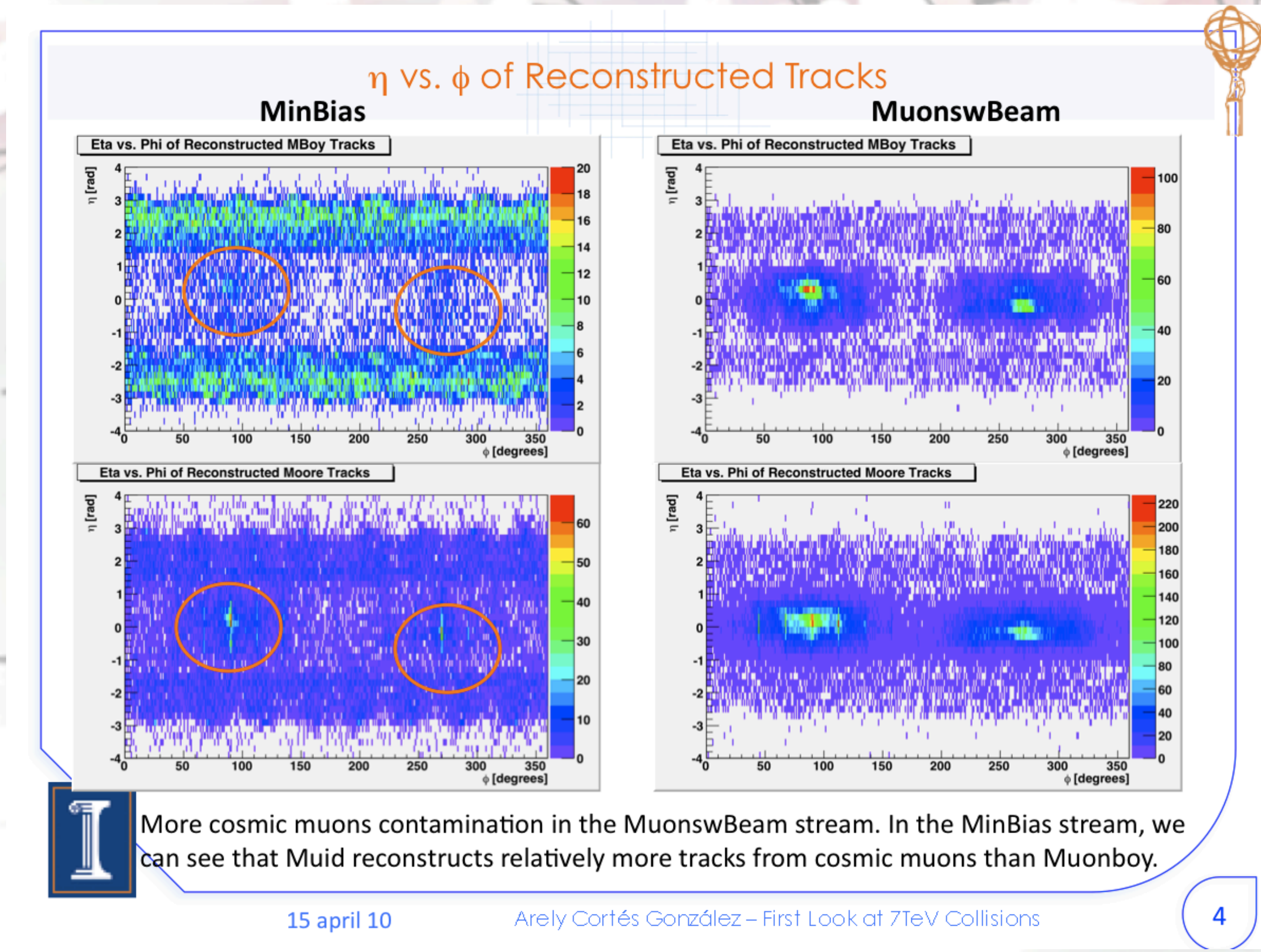
Examples of Muon Offline Monitoring

Monitoring of
alignment corrections

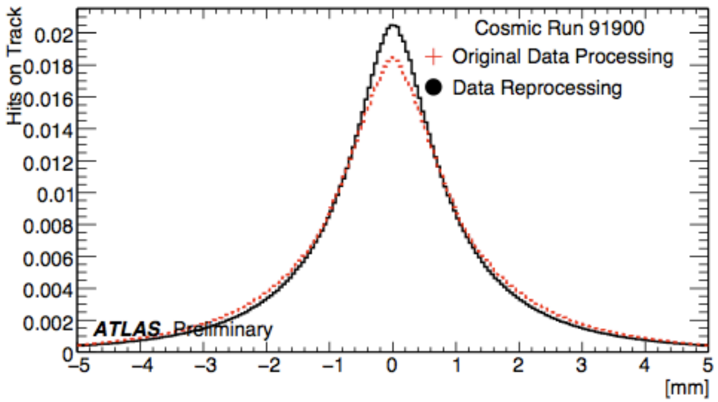


Examples of Muon Offline Monitoring

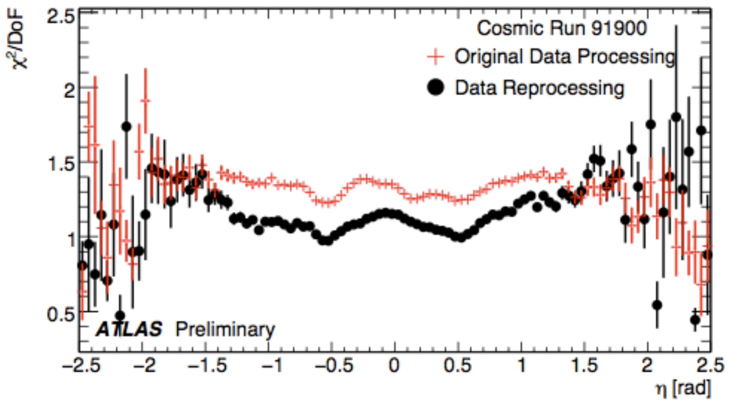
First look at Muons with 7TeV collisions



Validation of data reprocessing



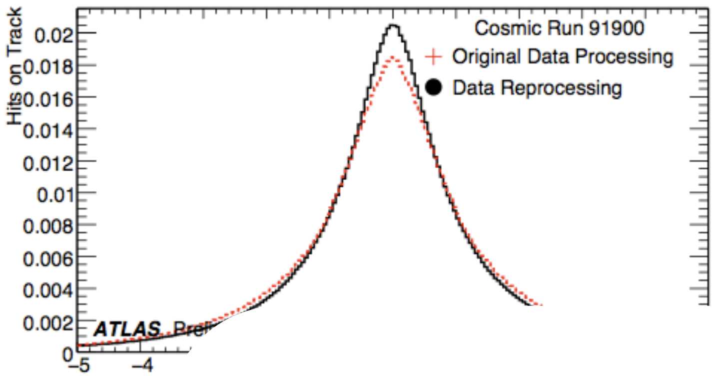
(a) Hits on track residuals.

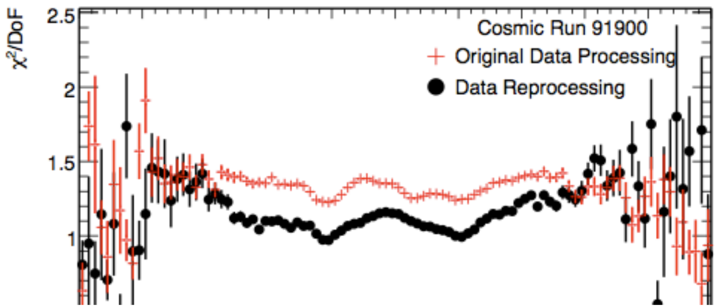


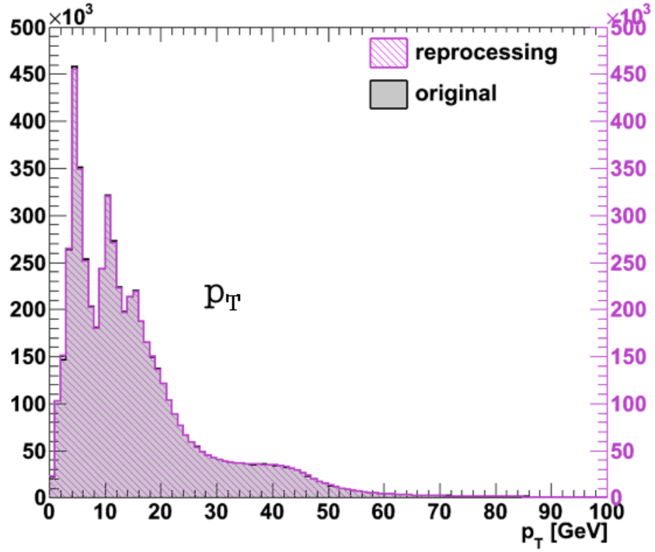
(b) χ^2 per degree of freedom of track fit.

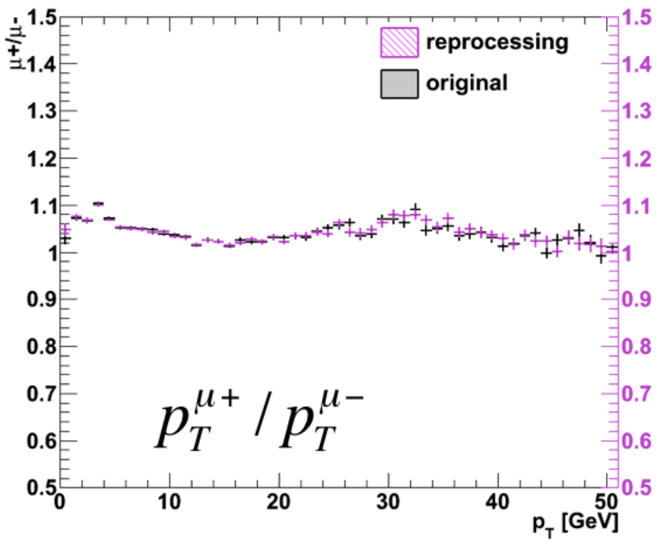
Examples of Muon Offline Monitoring

Validation of data reprocessing









Top Physics: Introduction & Motivation

The Top quark, the heaviest known elementary particle, provides an interesting probe of the Standard Model.

Furthermore, because of its large mass, provides a window onto physics *beyond* the Standard Model.

Top Quark Pair Production Cross Section

This measurement, in different decay modes, is a sensitive test of the Standard Model description of the Top Quark.

A measured cross section that differs from the Standard Model prediction can be a sign of new physics, plus top quark pair production is an important background in many searches for physics beyond the Standard Model.

Motivation

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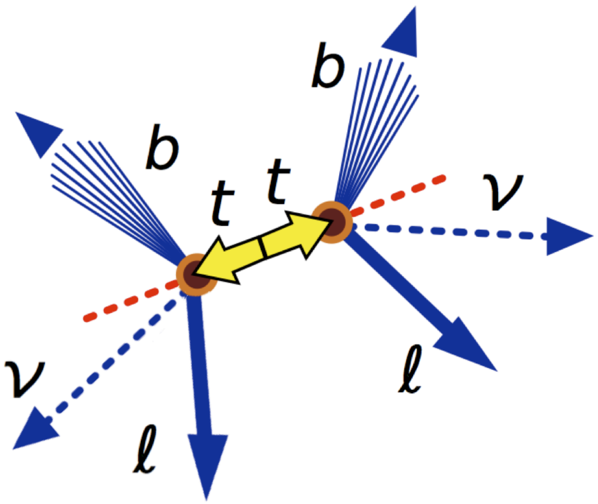

→ Here we present the top-quark production in dilepton final states.

The top is predicted to decay nearly 100% of the times into a W boson and a b-quark

Motivation

Top Quark Pair Production Cross Section

This measurement, in different decay modes is a sensitive test of the

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Here

Flavor Changing Neutral Currents in Top Decays

Deviations from the decay and production predictions from the Standard Model give a model-independent test for physics beyond Standard Model.

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Flavor Changing Neutral Currents in Top Decays

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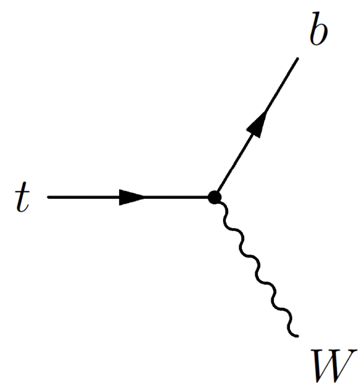
In the Standard Model the top is predicted to decay nearly 100% of the times into a W boson and a b-quark.



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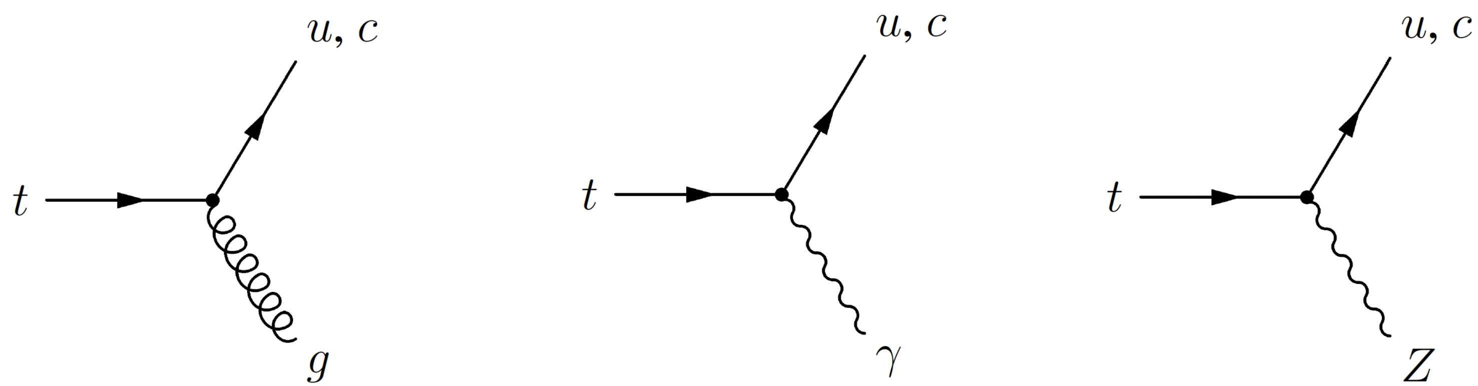
Flavor Changing Neutral currents are forbidden at tree level, and are allowed at one-loop level with a branching ratio of the order of 10^{-14}



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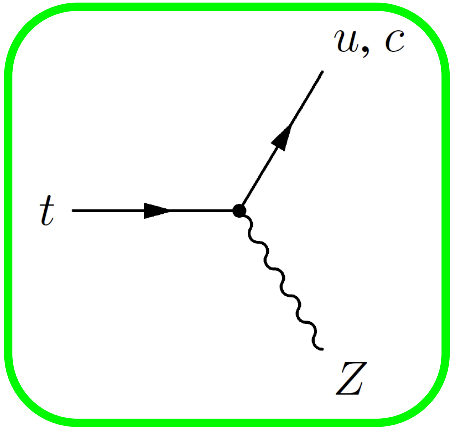
Process	SM	QS	2HDM	FC 2HDM	MSSM	$\not{R}$ SUSY	TC2	RS
$t \to u\gamma$	$3.7 \cdot 10^{-16}$	$7.5 \cdot 10^{-9}$	—	—	$2 \cdot 10^{-6}$	$1 \cdot 10^{-6}$	—	$\sim 10^{-11}$
$t \to uZ$	$8 \cdot 10^{-17}$	$1.1 \cdot 10^{-4}$	—	—	$2 \cdot 10^{-6}$	$3 \cdot 10^{-5}$	—	$\sim 10^{-9}$
$t \to ug$	$3.7 \cdot 10^{-14}$	$1.5 \cdot 10^{-7}$	—	—	$8 \cdot 10^{-5}$	$2 \cdot 10^{-4}$	—	$\sim 10^{-11}$
$t \to c\gamma$	$4.6 \cdot 10^{-14}$	$7.5 \cdot 10^{-9}$	$\sim 10^{-6}$	$\sim 10^{-9}$	$2 \cdot 10^{-6}$	$1 \cdot 10^{-6}$	$\sim 10^{-6}$	$\sim 10^{-9}$
$t \to cZ$	$1 \cdot 10^{-14}$	$1.1 \cdot 10^{-4}$	$\sim 10^{-7}$	$\sim 10^{-10}$	$2 \cdot 10^{-6}$	$3 \cdot 10^{-5}$	$\sim 10^{-4}$	$\sim 10^{-5}$
$t \to cg$	$4.6 \cdot 10^{-12}$	$1.5 \cdot 10^{-7}$	$\sim 10^{-4}$	$\sim 10^{-8}$	$8 \cdot 10^{-5}$	$2 \cdot 10^{-4}$	$\sim 10^{-4}$	$\sim 10^{-9}$



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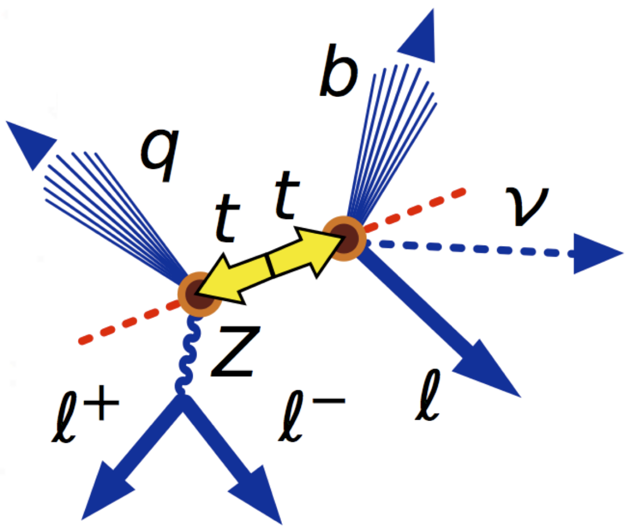


We search for
Flavor Changing Neutral Currents
in top quark decays.

in top-quark pair production events: with one top quark decaying through $t \rightarrow qZ$, and the other through the Standard Model dominant mode $t \rightarrow bW$.

Only leptonic decays of the bosons (W, Z) are signal

Motivation

Top Quark Pair Production Cross Section

This measurement, in different decay modes is a sensitive test of the Standard Model description of the Top Quark.

A measu… …ndard Model prediction c… …k pair production is an impor… …ysics beyond the

Here we … …on final states.

Measured main background in our analysis

Flavor Changing Neutral Currents

Deviations from the decay and production predictions from the Standard Model give a model-independent test for physics beyond

Thesis work
Performed full analysis

Top quark pair pr… …aying through $t \rightarrow qZ$,
and the other through the Standard Model dominant mode $t \rightarrow bW$.

Object Selection

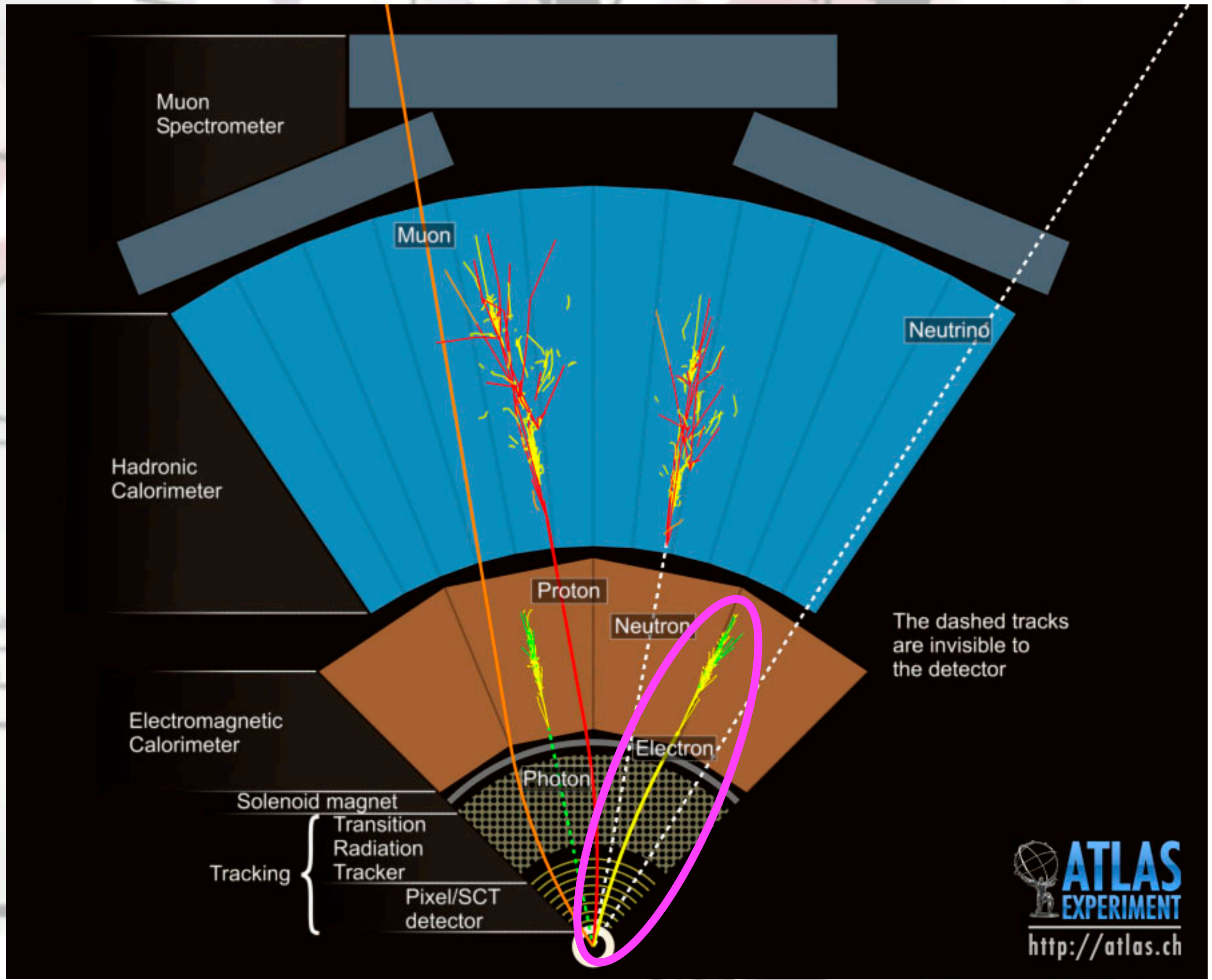
electrons

Isolated Electromagnetic clusters associated to Inner Detector track

Large Transverse Momentum

$|\eta| < 2.47$

Exclude transition region between Barrel and End-Cap



Object Selection

electrons

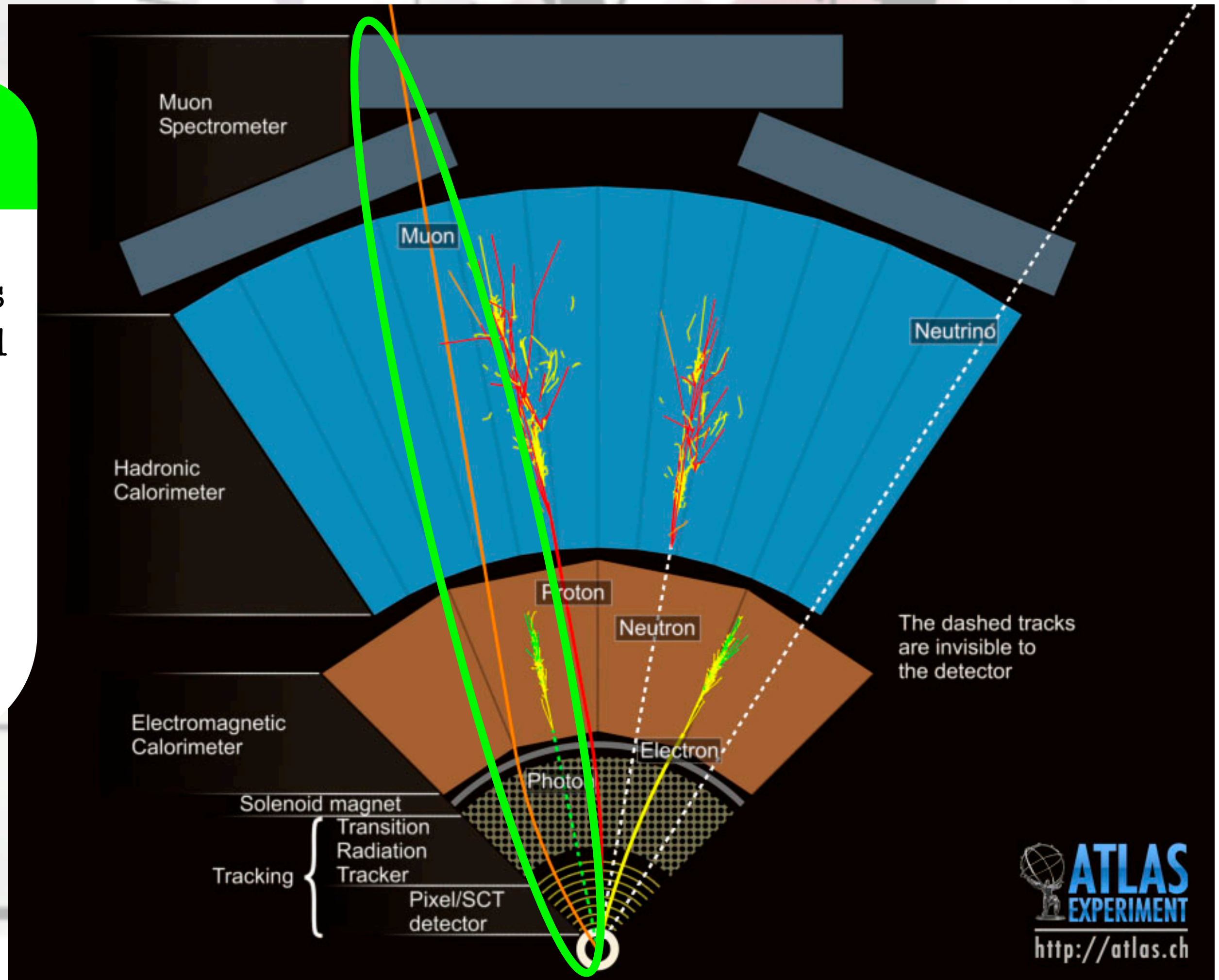
muons

Track segments from muon spectrometer matched to tracks from inner detector, and refitted

Large Transverse Momentum

$|\eta| < 2.5$

Isolated in both calorimeter and inner detector



Object Selection

electrons

muons

tracks

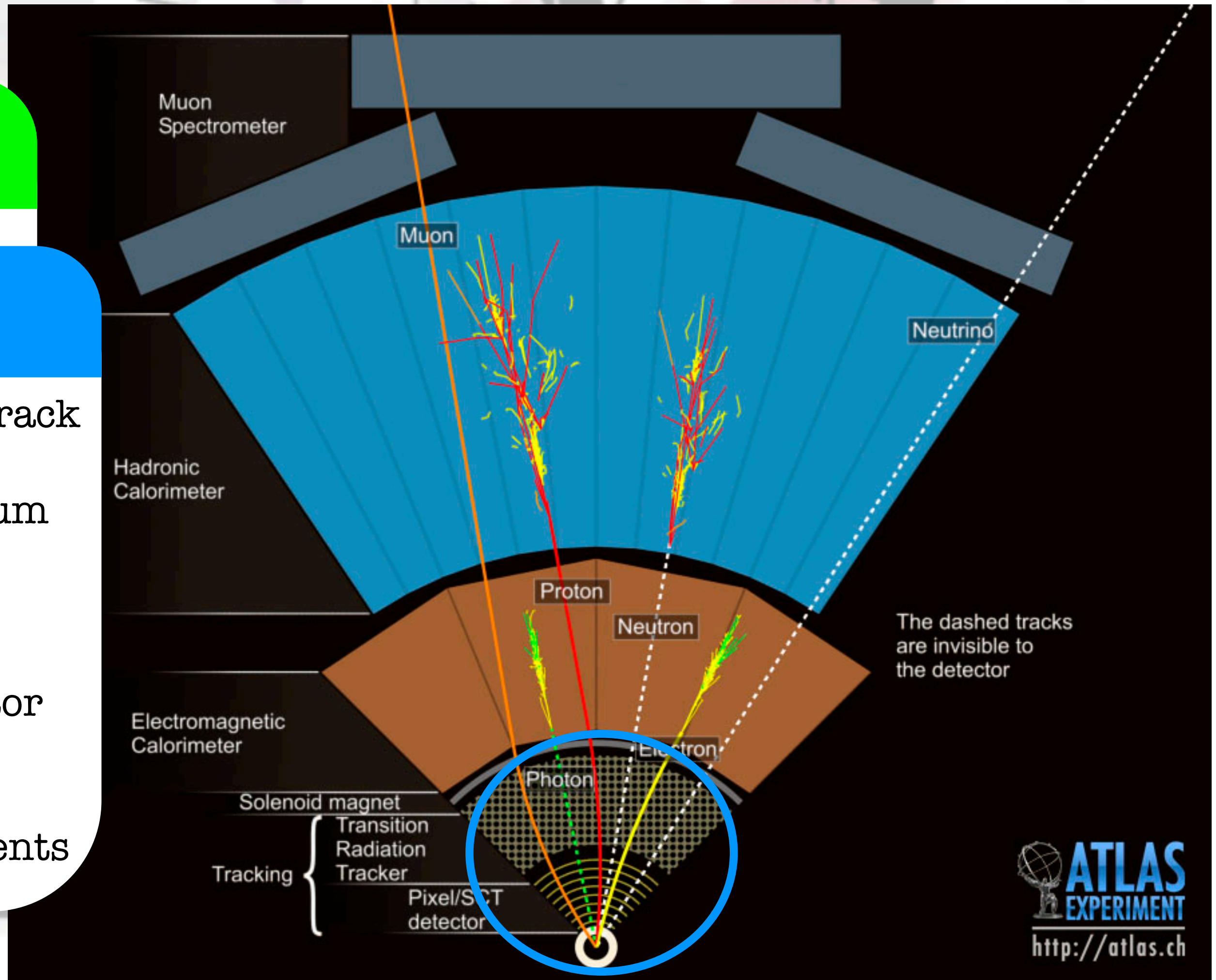
High quality inner detector track

Large Transverse Momentum

$|\eta| < 2.4$

Isolated in the inner detector (from nearby tracks)

Inner detector hit requirements



electrons

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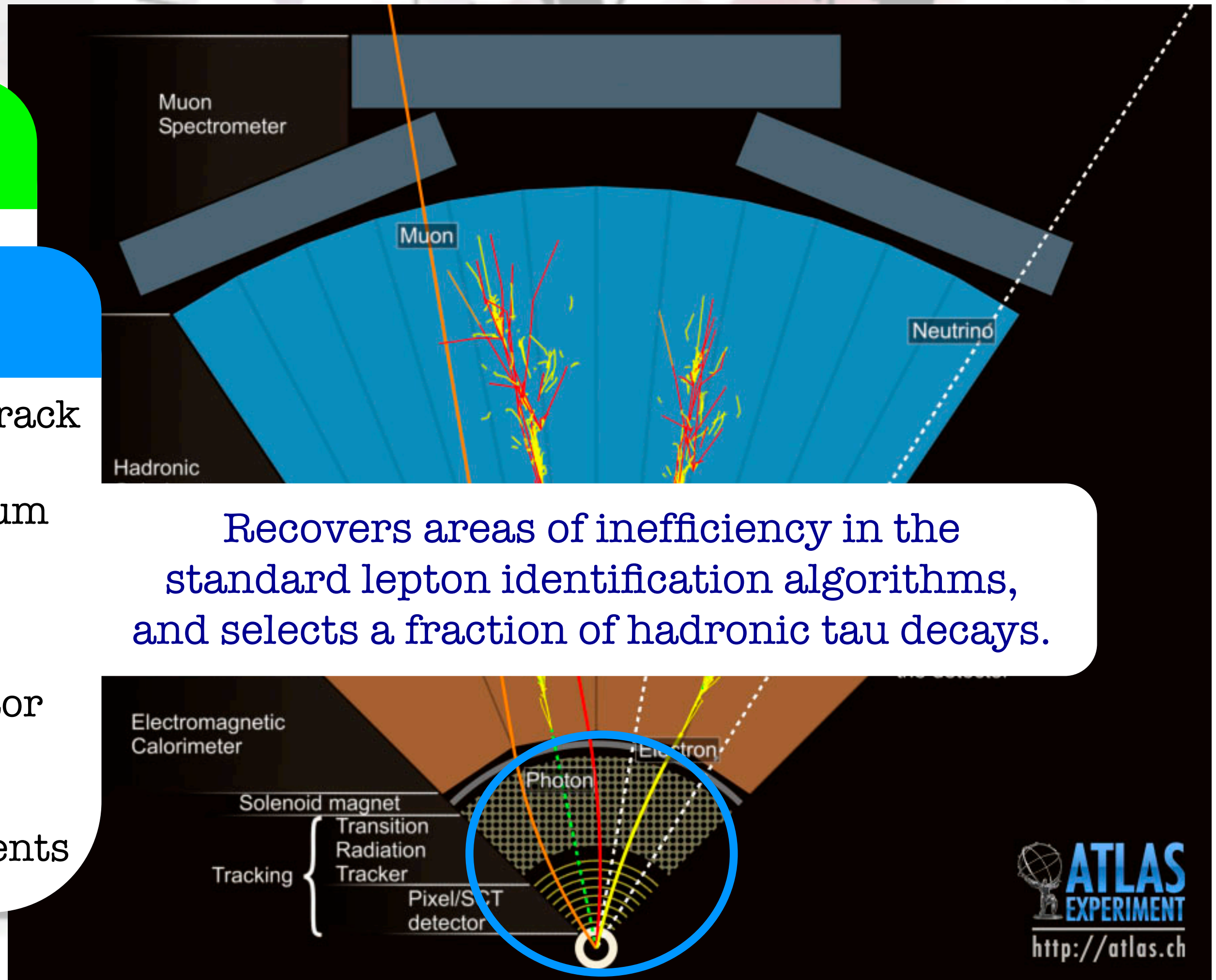

Recovers areas of inefficiency in the standard lepton identification algorithms, and selects a fraction of hadronic tau decays.

electrons

muons

Track segments from muon

T sp fr

tracks

High q

Tr

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Is

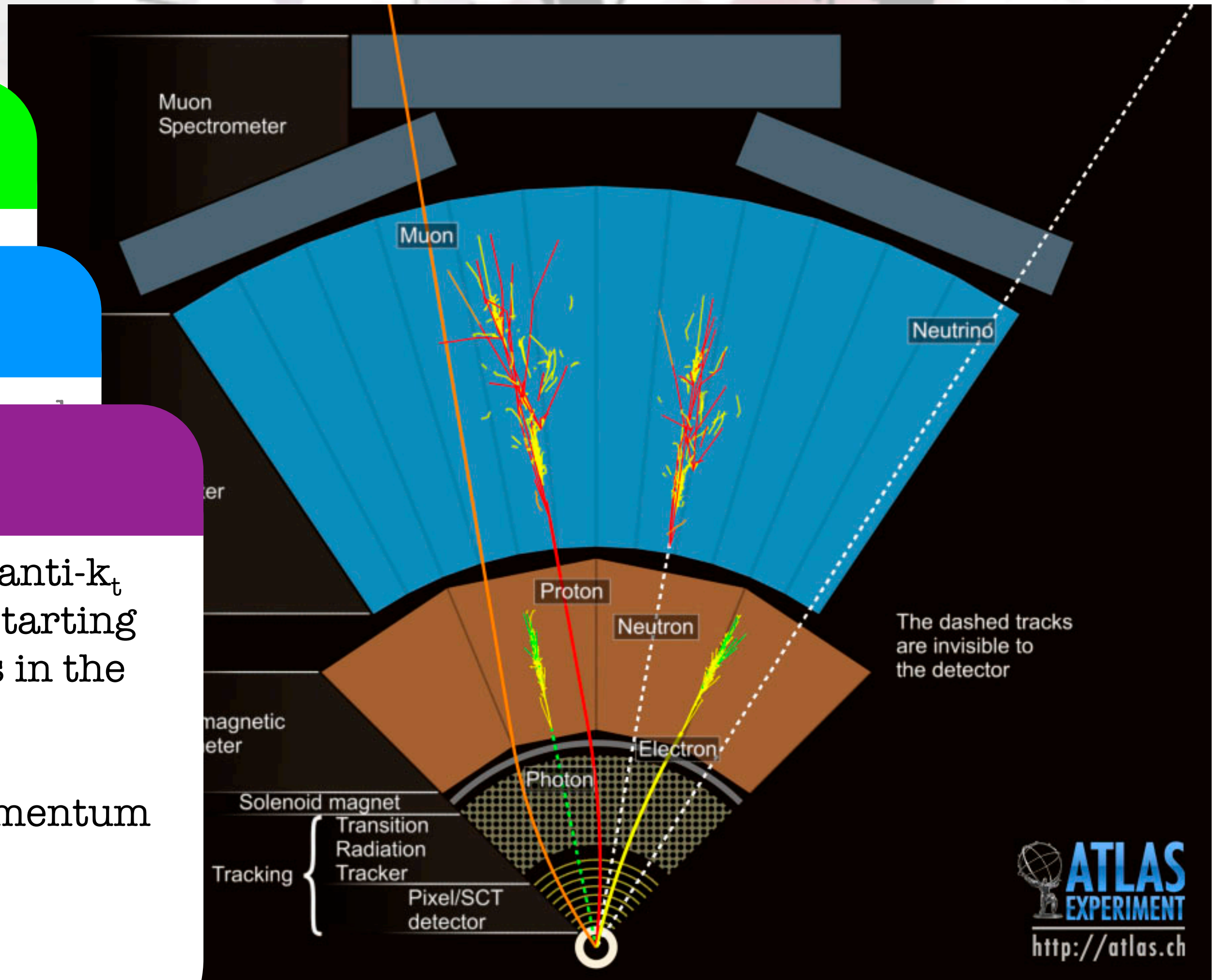
Is

jets

Reconstructed with anti-k_t algorithm, $\Delta R = 0.4$, starting from energy clusters in the calorimeter

Large Transverse Momentum

$|\eta| < 2.5$



Object Selection

electrons

muons

Track segments from muon

T sp fr

tracks

Tr High q

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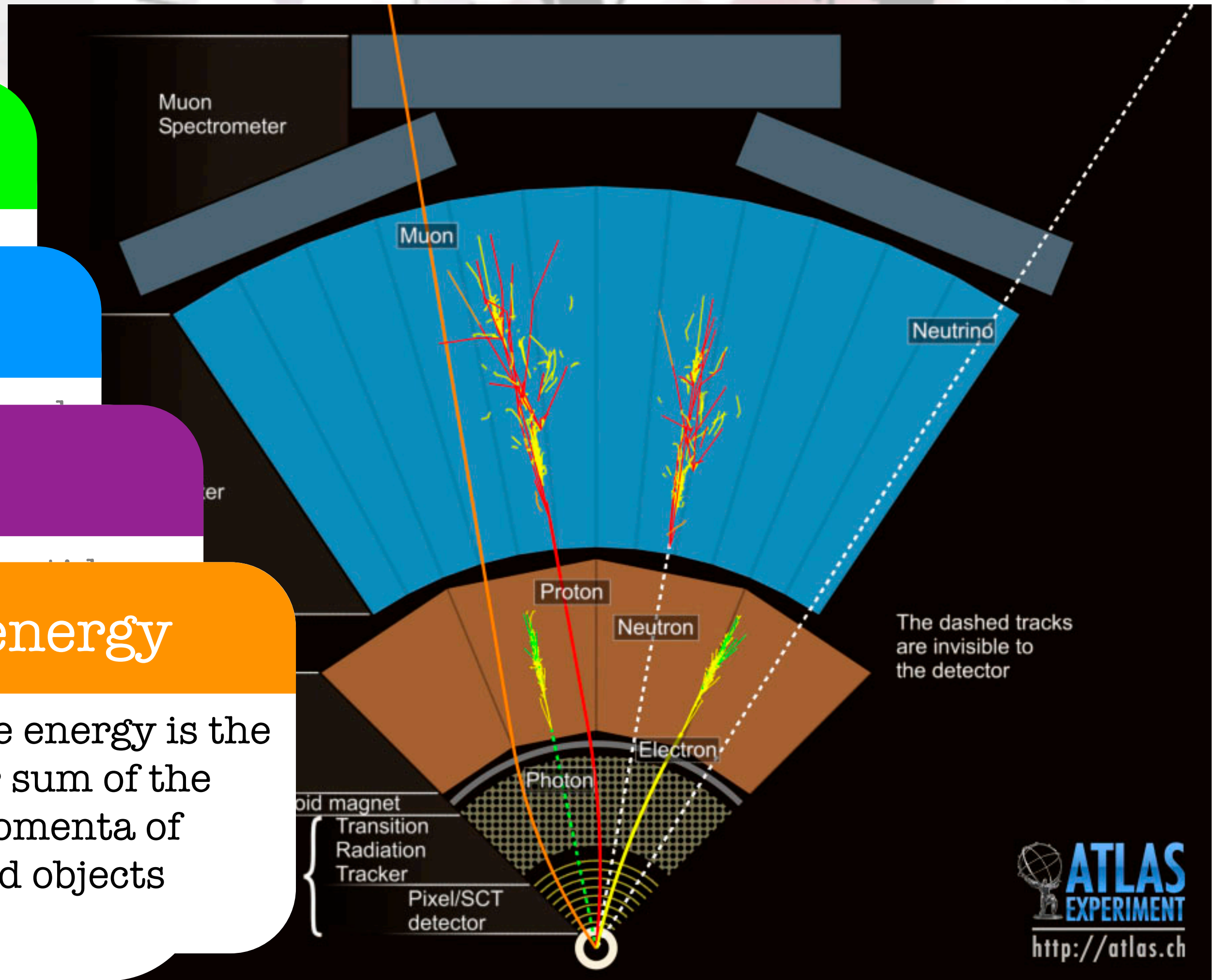
missing energy

Missing transverse energy is the negative vector sum of the transverse momenta of reconstructed objects



Top Quark Pair Production Cross Section

Events are selected by inclusive single electron or muon trigger.

Requirements on missing transverse energy, di-lepton invariant mass, and scalar p_T sum of all selected jets and leptons are optimized to minimize the expected total uncertainty on the cross section measurement.

We have 3 orthogonal selections combined in the final result

Non-b-tag lepton + track	Non-b-tag 2 leptons	b-tag 2 leptons
e+track, μ+track Select a pair of opposite signed lepton and track.	ee, eμ, μμ Select a pair of opposite signed leptons.	ee, eμ, μμ Select a pair of opposite signed leptons. Require at least one b-tagged jet

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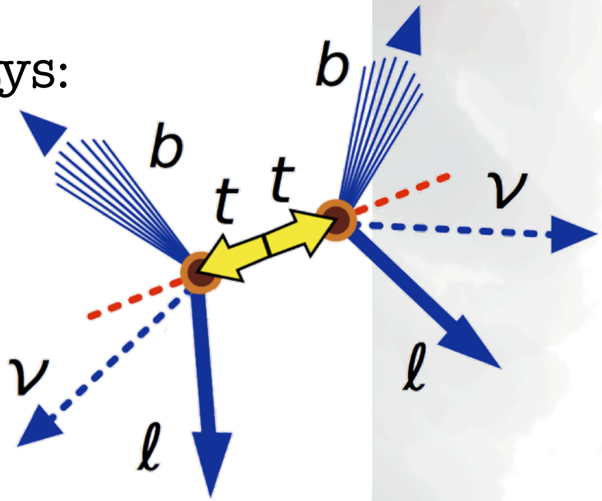
e+track, μ+track Select a pair of opposite signed lepton and track.	ee, eμ, μμ Select a pair of opposite signed leptons.	ee, eμ, μμ Select a pair of opposite signed leptons. Require at least one b-tagged jet

The selected track is orthogonal to other leptons in the event

Non-b-tag Lepton + track

- Select a pair of opposite signed lepton and track.
- at least 2 jets with large transverse momenta
- To reject backgrounds from vector-meson decays:
  invariant mass > 15 GeV
- To suppress background from Z/γ^*+jets :
  $|\text{invariant mass} - m_Z| > 10$ GeV
- Large missing transverse energy (>45 GeV)
- Large scalar p_T sum of selected objects (>150 GeV)



Backgrounds

Background contributions from Drell-Yan and fake track leptons are calculated with data-driven methods other backgrounds are determined using Monte Carlo samples

Monte Carlo backgrounds

Dibosons (WW, WZ, ZZ)
Single top
$Z/\gamma^* \rightarrow \tau\tau$ + jets

Backgrounds

Background contributions from Drell-Yan and fake track leptons are calculated with data-driven methods other backgrounds are determined using Monte Carlo samples

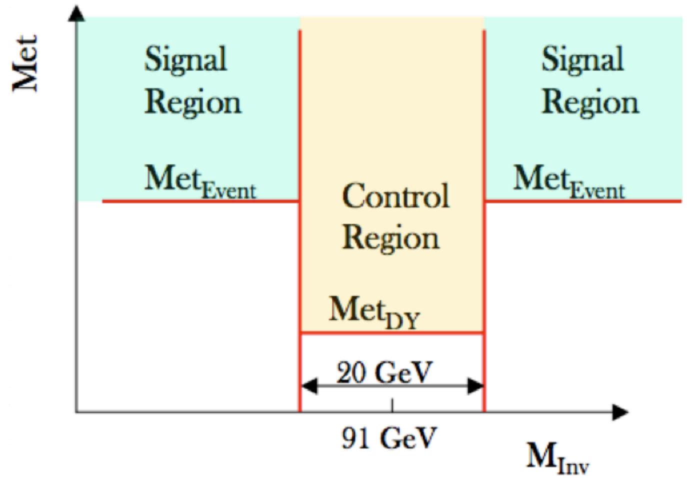
Monte Carlo background

Dibosons (WW, WZ
Single top
$Z/\gamma^* \rightarrow \tau\tau$ + jet

Measured this background to provide a cross check

Drell-Yan

Use a Control Region to compute a normalization factor between data and Monte Carlo



Then apply the normalization factor in Monte Carlo Signal Region:

$$[N^{\rm Data}_{Z+\rm jets}]_{\rm SR} = \left[\frac{N^{\rm Data} - N^{\rm MC}_{\rm Other\ \ backgrounds}}{N^{\rm MC}_{Z+\rm jets}}\right]_{\rm CR} \cdot [N^{\rm MC}_{Z+\rm jets}]_{\rm SR}$$

Backgrounds

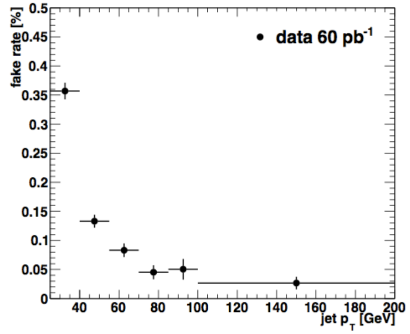
Background contributions from Drell-Yan and fake track leptons are calculated with data-driven methods other backgrounds are determined using Monte Carlo samples

Monte Carlo background

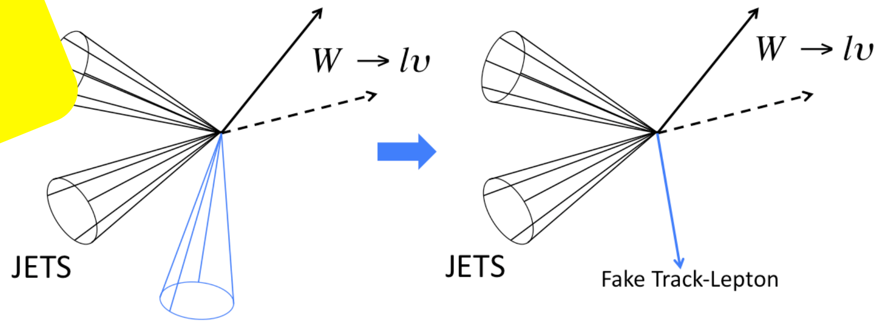
Dibosons (WW, WZ
Single top
$Z/\gamma^* \rightarrow \tau\tau + \mathrm{jet}$

fakes

Measure fake rates of tracks coming from jets in a γ+jets control region.



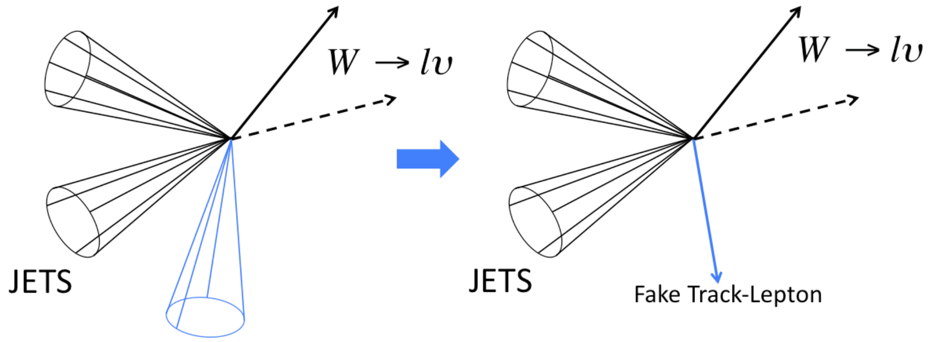
My contribution



Select lepton+jets events in data, and add the fake probability per jet.

fakes: strategy

We measure the probability that a jet fakes a track



$$\text{Fake Rate}\left(p_T, N_{PVX}\right) = \frac{(p_T, N_{PVX})\text{ of all selected tracks}}{(p_T, N_{PVX})\text{ of all ID jets \& jet} - \text{elements}}$$

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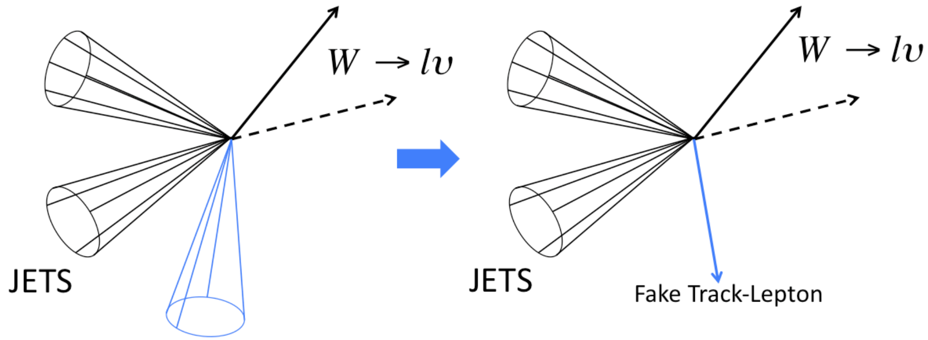
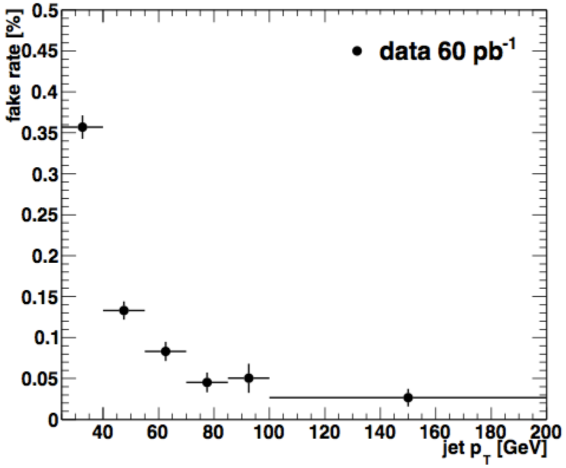
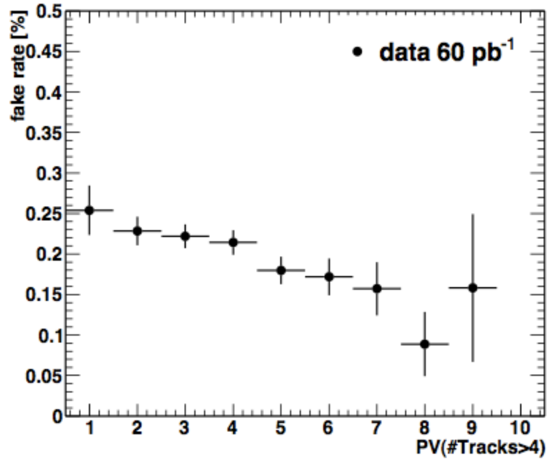


We do this in γ+jets events from data (Photon trigger, high p_T, isolated photon)





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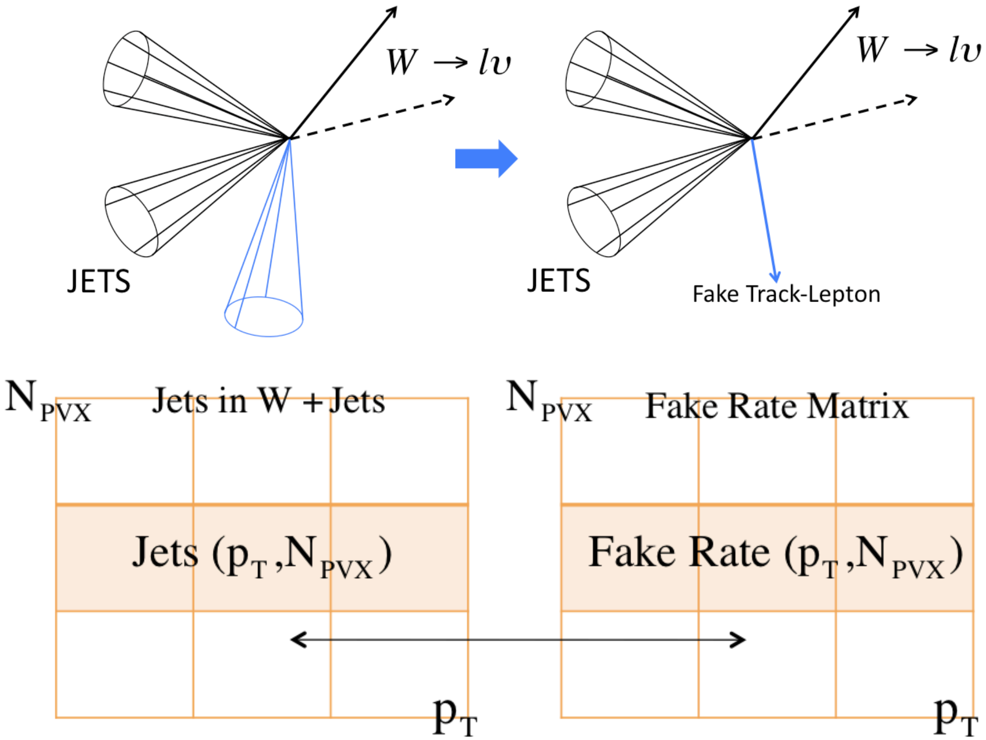

$$\text{Prediction} = \sum_{(p_T, N_{PVX})} \text{Jets}_{(p_T, N_{PVX})} \times \text{Fake Rate}_{(p_T, N_{PVX})}$$

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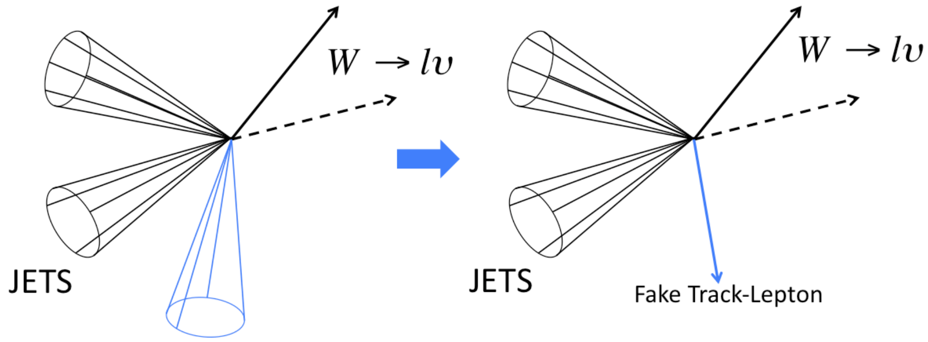


$$\text{Prediction} = \sum_{(p_T, N_{PVX})} \text{Jets}_{(p_T, N_{PVX})} \times \text{Fake Rate}_{(p_T, N_{PVX})}$$

Finally, the prediction must be multiplied by the fraction of fake tracks that have opposite charge the the lepton. This fraction is taken from MC in each jet multiplicity.

fakes: test in control regions

Performed test in **Z+jets** and W+jets events

	$Z \to ee$+fake		
# jets	Obs.	Pred.	(P-O)/P [%]
0	46	42.8±1.6	
1	20	17.2±0.6	
2	3	5.5 ±0.2	
3	2	1.61 ±0.06	
4	1	0.53 ±0.02	
≥ 5	1	0.17 ±0.00	
All	73	67.8 ±1.7	7.8 ± 0.9

	$Z \to \mu\mu$+fake		
# jets	Obs.	Pred.	(P-O)/P [%]
0	86	87.0±3.2	
1	41	35.2±1.3	
2	10	11.6±0.4	
3	5	3.0±0.1	
4	2	0.79±0.03	
≥ 5	1	0.26±0.01	
All	151	137.8±3.4	−9.6 ± 0.8

By comparing the agreement between prediction and observation, we estimate a 20% systematic uncertainty on the fake prediction

https://cdsweb.cern.ch/record/1378491

fakes: test in control regions

Performed test in Z+jets and **W+jets** events

	eTL				μTL			
#jets	O	B	P	(B-O)/P [%]	O	B	P	(B-O)/P [%]
0 (OS)	411	$436.3^{+38.4}_{-36.8}$	199.1 ± 9.3		460	$441.1^{+52.9}_{-52.0}$	321.9 ± 48.4	
1 (OS)	201	$207.1^{+16.9}_{-27.3}$	99.0 ± 4.2		247	$270.5^{+17.2}_{-16.5}$	142.5 ± 6.0	
2 (SS)	10	10.7 ± 0.8	7.6 ± 0.7		14	13.9 ± 1.0	11.1 ± 0.9	
3 (SS)	7	6.2 ± 0.5	5.4 ± 0.5		9	8.3 ± 0.7	7.0 ± 0.6	
4 (SS)	4	4.1 ± 0.4	3.8 ± 0.4		1	3.2 ± 0.4	3.1 ± 0.4	
≥ 5 (SS)	2	1.9 ± 0.1	1.8 ± 0.1		0	1.5 ± 0.2	1.4 ± 0.2	
Total	635	$666.4^{+41.9}_{-45.8}$	316.6 ± 10.3	$9.9^{+15.6}_{-16.5}$	731	$738.5^{+55.6}_{-54.6}$	487.0 ± 48.8	$1.5^{+12.7}_{-12.5}$

Background: includes the contribution from other sources (Z/g*, diboson, single top)
Prediction: contribution from fakes prediction only. (

By comparing the agreement between prediction and observation, we estimate a 20% systematic uncertainty on the fake prediction

https://cdsweb.cern.ch/record/1378491

Backgrounds

Background contributions from Drell-Yan and fake track leptons are calculated with data-driven methods other backgrounds are determined using Monte Carlo samples

Monte Carlo backgrounds

Dibosons (WW, WZ, ZZ)
Single top
$Z/\gamma^* \rightarrow \tau\tau + \text{jets}$

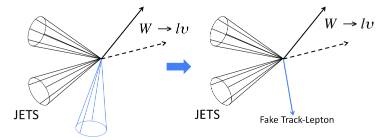
Drell-Yan

Use a Control Region to compute a normalization factor between data and Monte Carlo

$$[N^{\mathrm{Data}}_{Z+\mathrm{jets}}]_{\mathrm{SR}} = \left[\frac{N^{\mathrm{Data}} - N^{\mathrm{MC}}_{\mathrm{Other\ backgrounds}}}{N^{\mathrm{MC}}_{Z+\mathrm{jets}}}\right]_{\mathrm{CR}} \cdot [N^{\mathrm{MC}}_{Z+\mathrm{jets}}]_{\mathrm{SR}}$$

fakes

Measure fake rates of tracks coming from jets; add fake probability per jet in parent sample



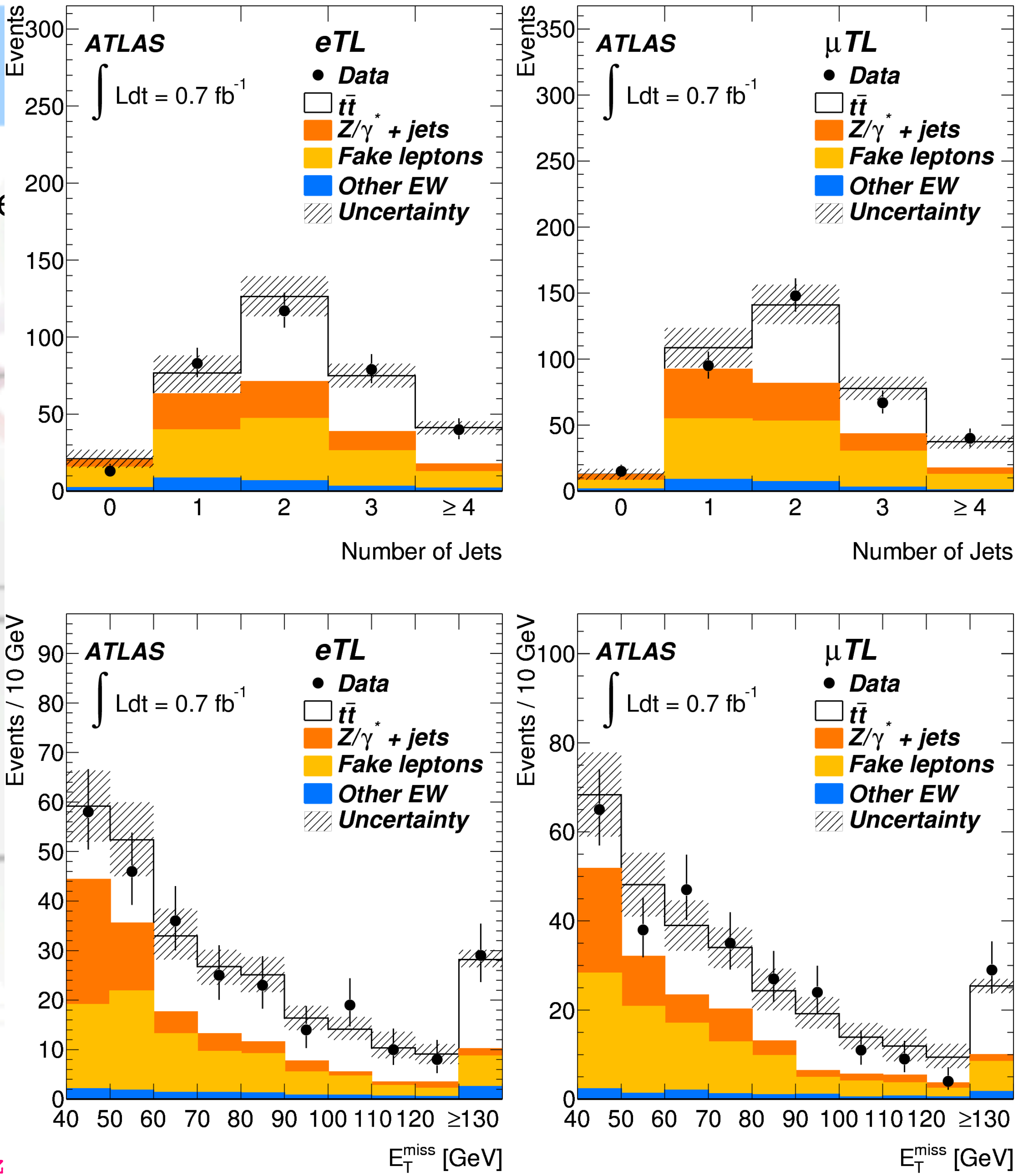
Cross Section Results

With the final yields from background expectation, data observation and signal selection efficiency,

	eTL	μTL
Z/γ^{*}+ jets	$24.3^{+10.7}_{-9.4}$	$22.0^{+5.3}_{-5.8}$
$Z/\gamma^{*} \rightarrow \tau\tau$+jets	$17.0^{+8.4}_{-7.6}$	25 ± 11
Fake leptons	74 ± 15	85 ± 17
Single top quark	$5.7^{+1.0}_{-0.9}$	$6.3^{+0.8}_{-1.1}$
Diboson	$5.9^{+0.9}_{-0.8}$	$4.8^{+0.6}_{-0.7}$
Total background	126^{+20}_{-19}	142 ± 21
Predicted $t\bar{t}$	$112\ ^{+16}_{-18}$	$110\ ^{+17}_{-16}$
Total	239 ± 26	253 ± 27
Observed	236	255

Signal selection efficiency is measured in MC@NLO Monte Carlo sample, assuming a m_t = 172.5 GeV

With the ervation



Cross Section Results

With the final yields from background expectation, data observation and signal selection efficiency, we compute the cross section:

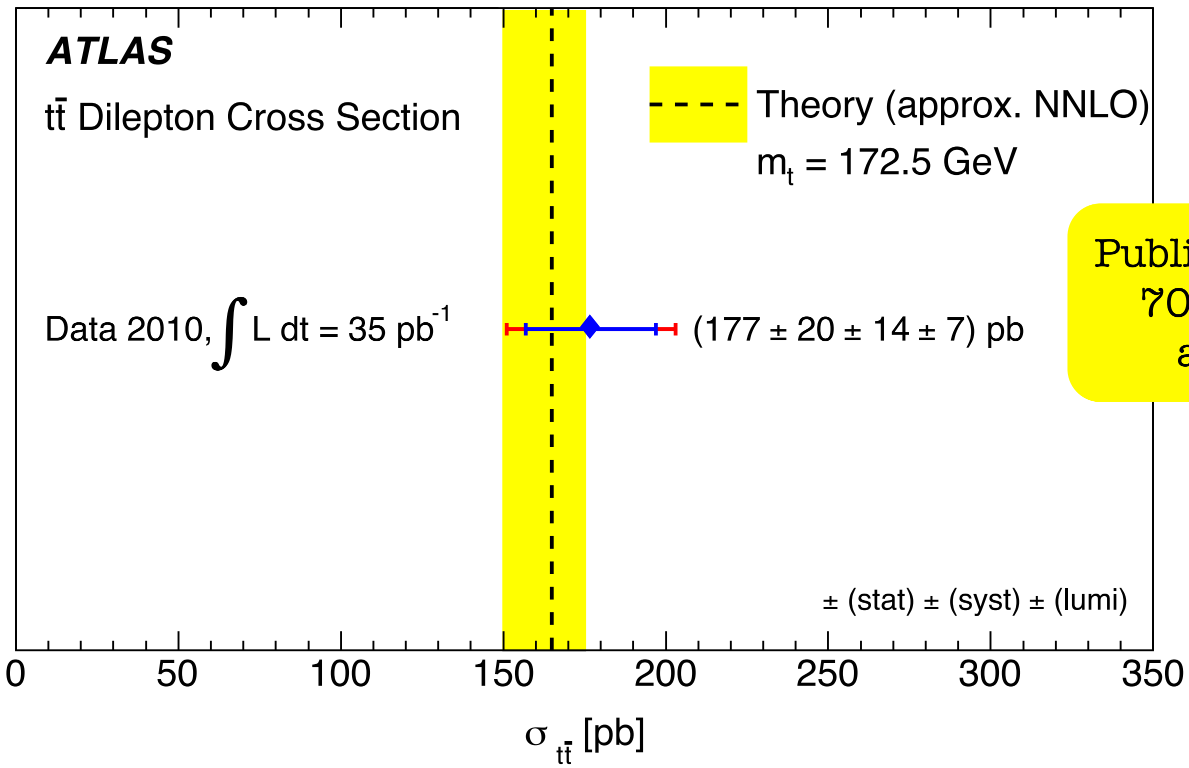
Cut&Count Method:

$$\sigma_{t\bar{t}} = \frac{N_{obs} - N_{bkg}}{A \bullet \varepsilon \bullet \int L dt}$$

The final result is the combination of the different channels I introduced...

Cross Section Results

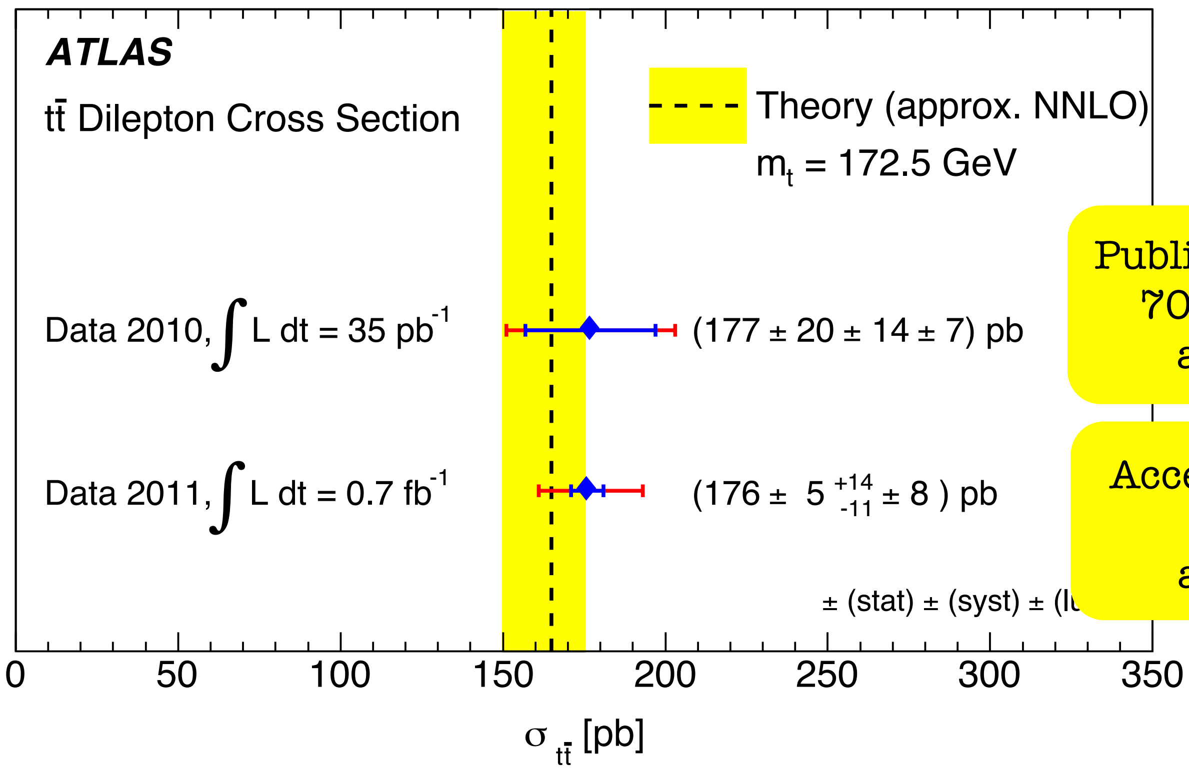
Top Quark Pair Production Cross Section



Published in Phys. Lett.B. 707 (2012) 459-477
arXiv:1108.3699

Cross Section Results

Top Quark Pair Production Cross Section



Published in Phys. Lett.B. 707 (2012) 459-477
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Accepted for publication in JHEP
arXiv:1202.4892

Flavor Changing Neutral Currents

Events are selected by inclusive single electron or muon trigger.

Requirements on missing transverse energy, invariant mass of different reconstructed objects, and b-tagging requirements are optimized for better signal efficiency vs. background rejection.

We have 2 orthogonal selections combined in the final result

2 leptons + track	3 leptons
Select 2 leptons (e,μ) + track Require at least one b-tagged jet	Select 3 leptons (e,μ)

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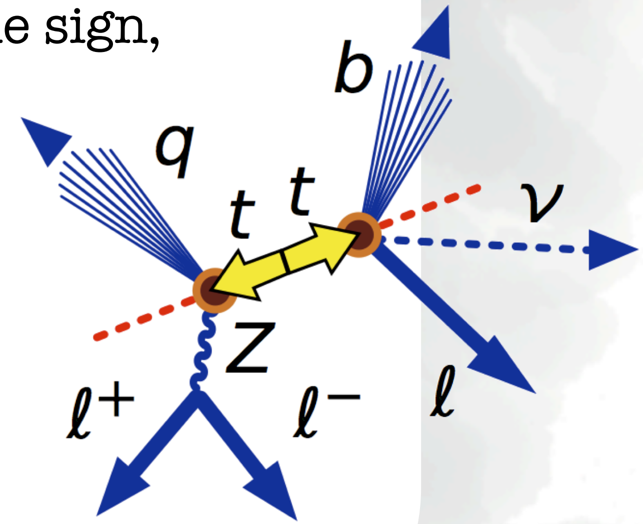
The selected track is orthogonal to other leptons in the event

Flavor Changing Neutral Currents

2 leptons + track

- Select two leptons and one track
- at least 2 jets with large transverse momenta
  One of them b-tagged
- We should have at least two leptons with same sign, same flavor ('Z-candidate')
- Large missing transverse energy (>20 GeV)



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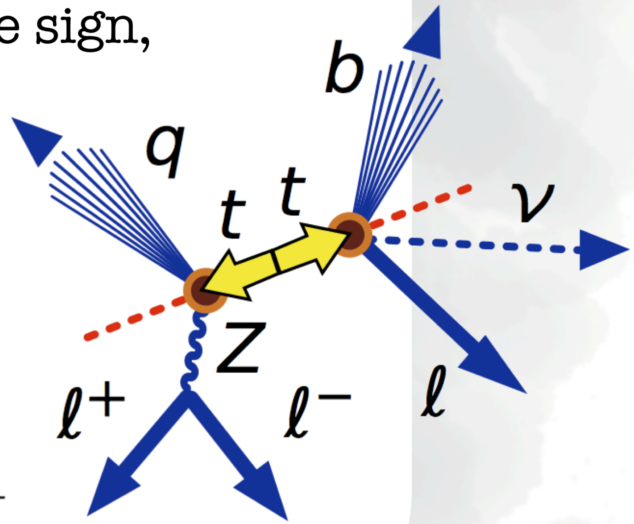
- Large missing transverse energy (>20 GeV)
- Reconstruct the objects by minimizing:

$$\chi^2 = \frac{\left(m_t^{FCNC} - m_t\right)^2}{\sigma_{m_t}^2} + \frac{\left(m_t^{SM} - m_t\right)^2}{\sigma_{m_t}^2} + \frac{\left(m_W^{SM} - m_W\right)^2}{\sigma_{m_W}^2} + \frac{\left(m_Z^{SM} - m_Z\right)^2}{\sigma_{m_Z}^2}$$



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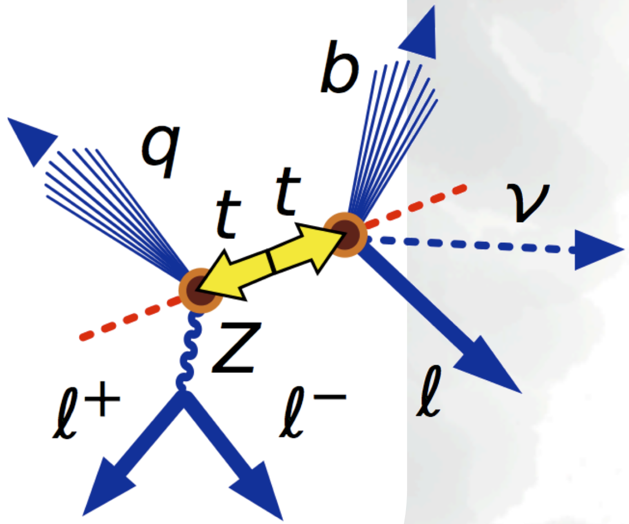
and looping over all jet and lepton assignments and p_z neutrino values (the missing transverse energy is taken to be the neutrino's transverse momentum).



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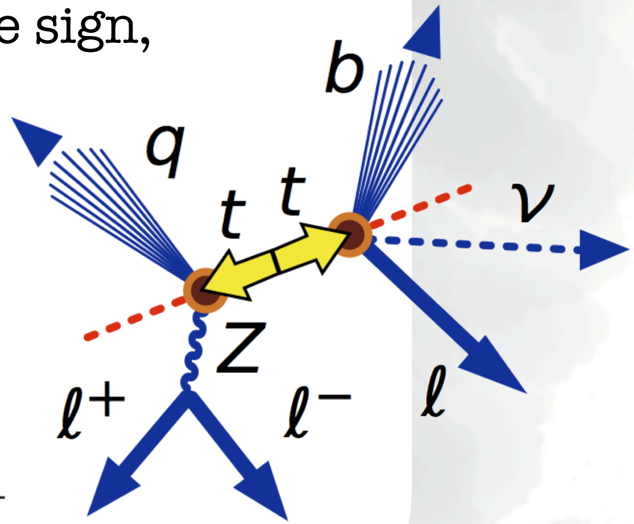

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$|m_Z - 90\ \mathrm{GeV}| < 15$ GeV, $|m_W - 80\ \mathrm{GeV}| < 30$ GeV, $|m_t - 172\ \mathrm{GeV}| < 40$ GeV

Backgrounds

Background from processes with at least three real leptons are determined using Monte Carlo samples. Backgrounds with at least one fake lepton are calculated with data-driven methods.

Monte Carlo backgrounds

Dibosons (WZ, ZZ)

Backgrounds

Background from processes with at least three real leptons are determined using Monte Carlo samples. Backgrounds with at least one fake lepton are calculated with data-driven methods.

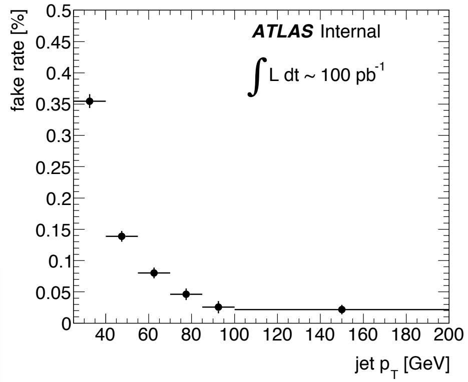
Monte Carlo backgr

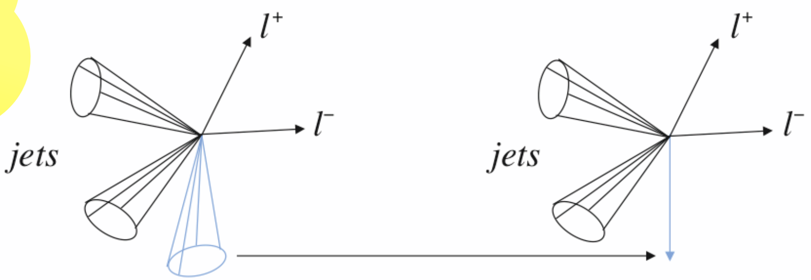
Dibosons

fakes

Includes: 2 real leptons + fake track
t-tbar, Z/γ*, WW, etc

Measure fake rates of tracks coming from jets in a γ+jets control region.





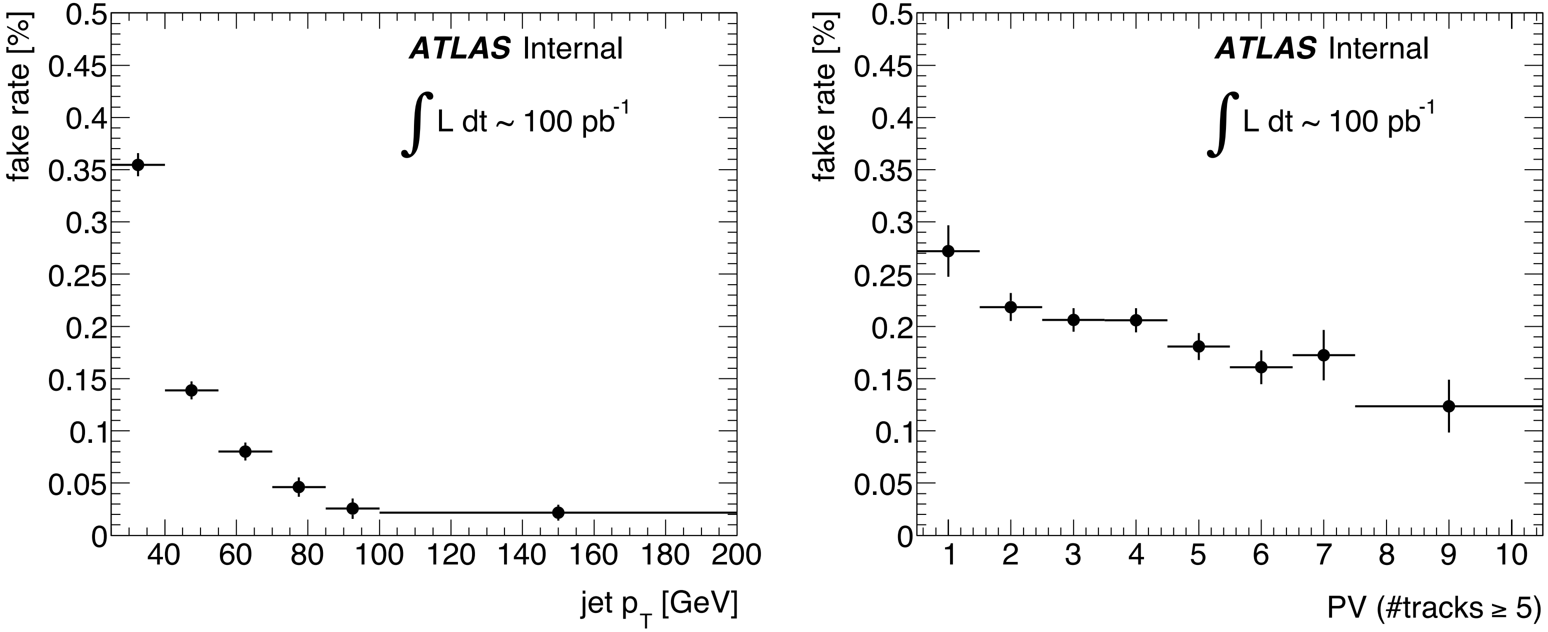
Select dilepton + jets events in data, and add the fake probability per jet.

Same technique as in cross-section, different parent sample

Backgrounds

Fakes

Update the fake rates
(now using TLs and jets with $p_T > 25$ GeV)



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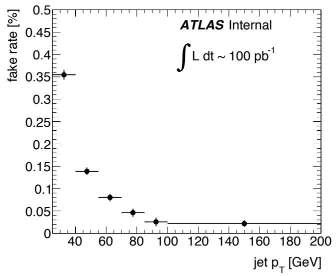
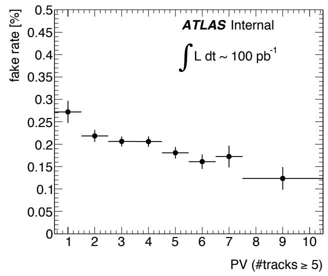
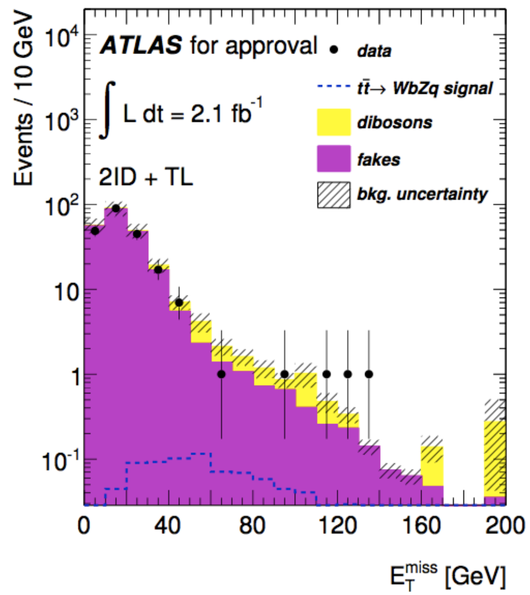




New Control Region: two regions in E_T^{miss}
for 2 leptons + fake, one jet events
https://cdsweb.cern.ch/record/1416758

E_T^{miss} Control Region					
E_T^{miss}	ZZ and WZ	Fake TL Prediction	Total Bkg	data	$(B-O)/P$
$\leq$ 20 GeV	$4.03^{+1.97}_{-2.18}$	143.54 ± 2.83	$147.57^{+3.45}_{-3.57}$	139	$\left(6.0^{+\ 8.3}_{-\ 8.4}\right)$ %
> 20 GeV	$10.79^{+5.28}_{-5.84}$	77.35 ± 1.43	$88.14^{+5.47}_{-6.01}$	74	$\left(18.3^{+13.1}_{-13.4}\right)$ %



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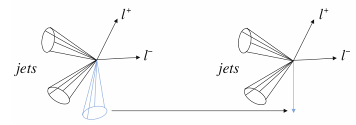

Data observation

Good agreement between data observation
and expected Standard Model background

2ID + TL	
ZZ and *WZ*	$1.03^{+0.50}_{-0.56}$
fakes	7.58 ± 2.20
total	$8.61^{+2.25}_{-2.27}$
data	8
signal efficiency	$\left(0.045 \pm 0.001^{+0.006}_{-0.007}\right)\%$

Signal selection efficiency is measured in TopRex signal Monte Carlo sample

Data observation

2 leptons + track give a 22% gain wrt the 3-leptons channel alone.

2 leptons + track	3 leptons
$(0.045 \pm 0.001^{+0.006}_{-0.007})\%$	$(0.205 \pm 0.003 \pm 0.022)\%$

Remember that the 2leptons+track is orthogonal to the 3-leptons !

(overlapping events are removed)

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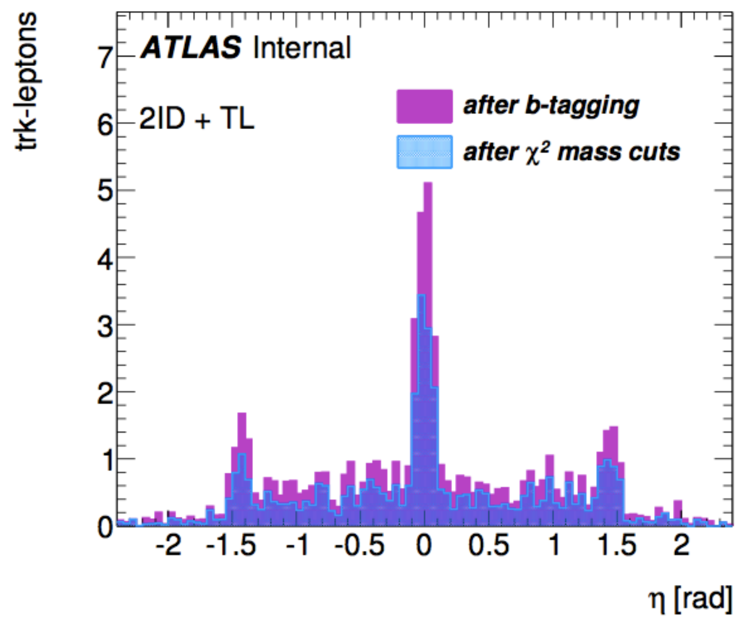
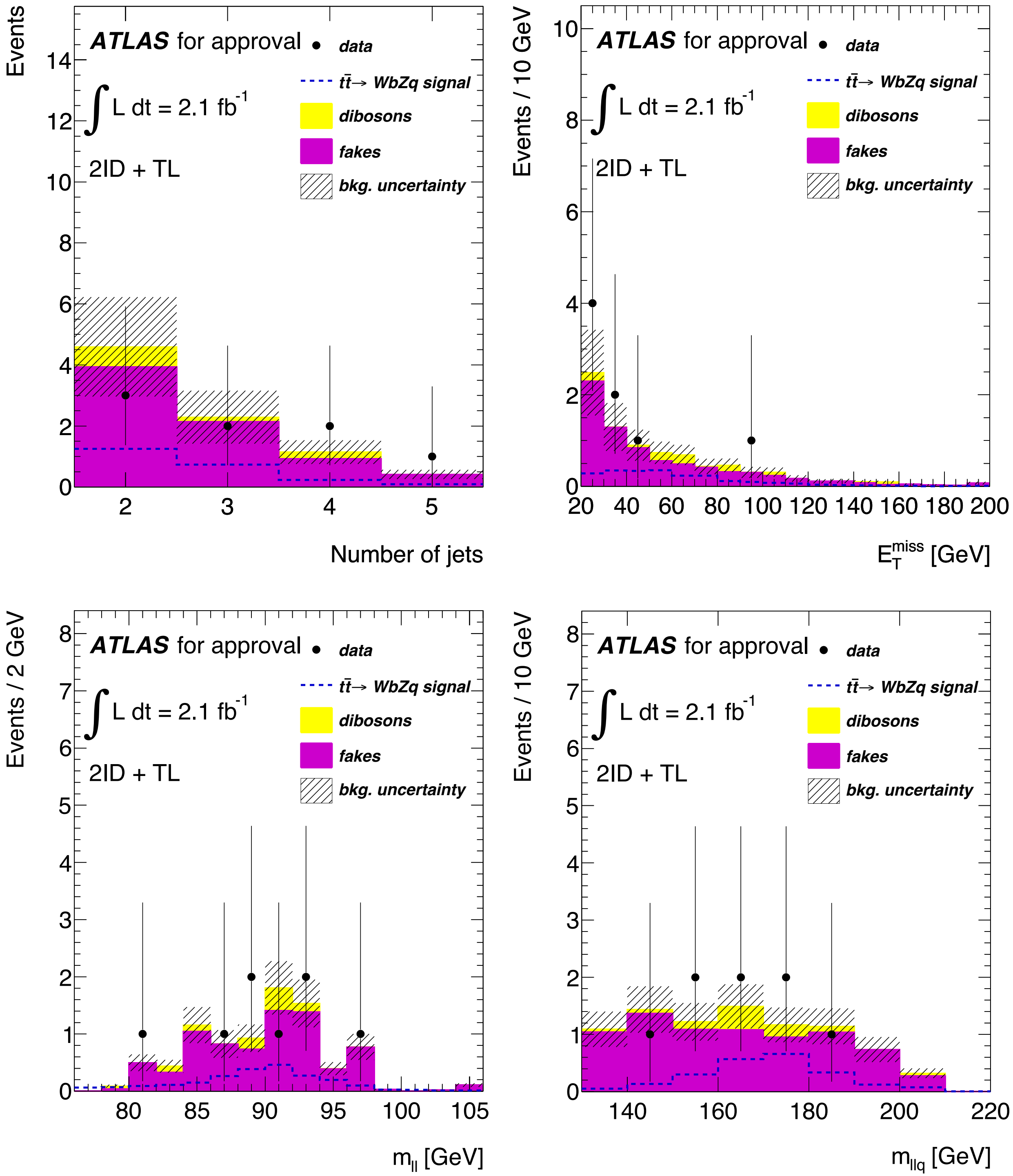




Signal distribution is normalized to the observed BR

FCNC Results

Good agreement between data observation
and expected Standard Model background

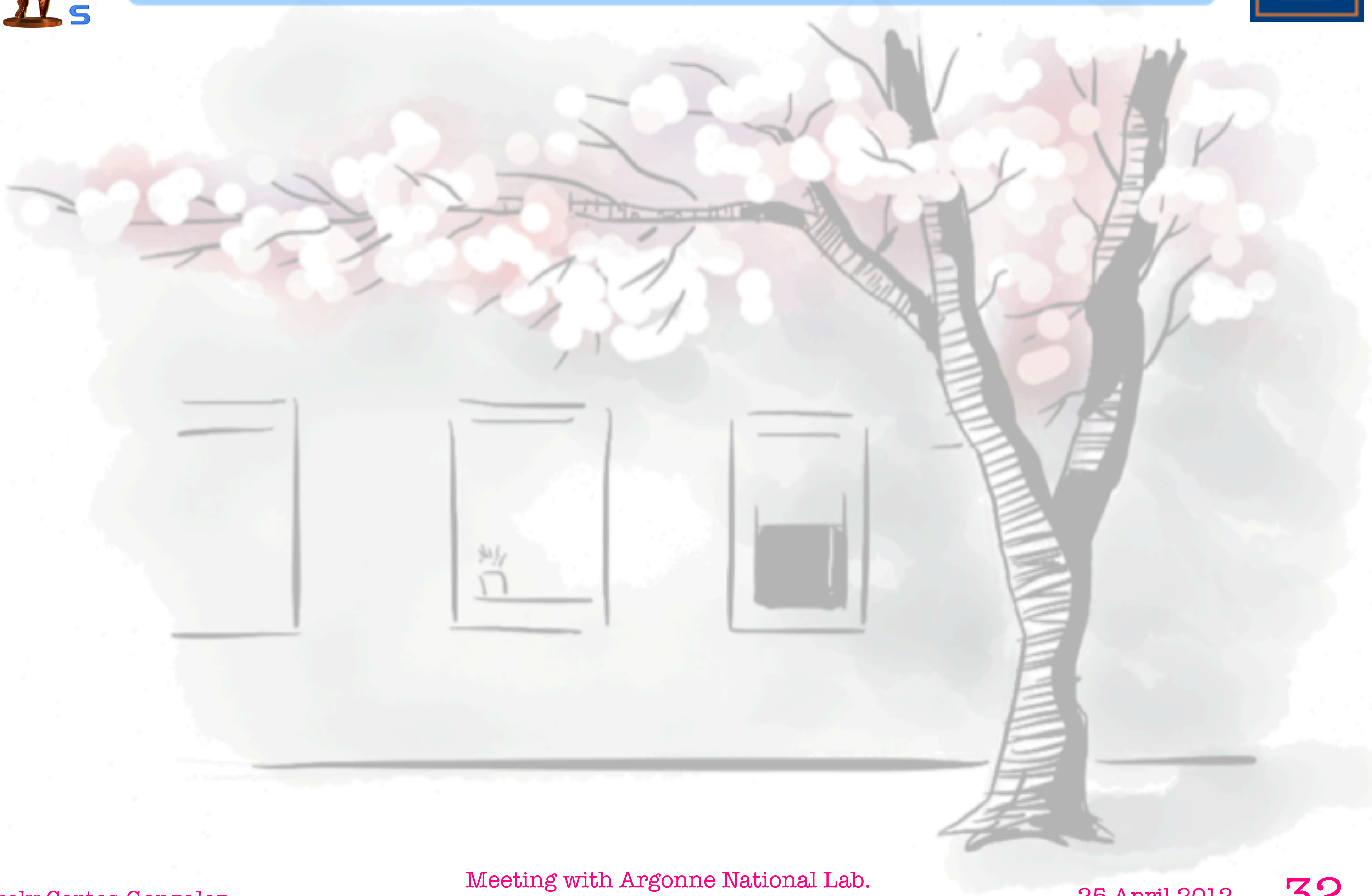
No evidence for flavor changing neutral currents is found.

We derive 95% CL limits on the BR for this decay.
Statistical & systematic uncertainties are taken into account

channel	observed	(-1σ)	expected	$(+1\sigma)$
stat. and syst. uncertainties:				
3ID	0.81%	0.63%	0.96%	1.41%
2ID+TL	3.15%	2.12%	2.97%	4.41%
Combination	0.72%	0.58%	0.91%	1.37%

Paper draft in circulation
inside ATLAS
https://cdsweb.cern.ch/record/1439014

Plans



Plans

Physics Analysis

We expect about 10-15 fb^{-1} of 8TeV pp collisions data by the end of this year data taking.

More BSM searches will become interesting!

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t-tbar like resonances,

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My early introduction to ATLAS was done with some tau-selection optimization studies done in the context of FTK, in collaboration with the Chicago group.

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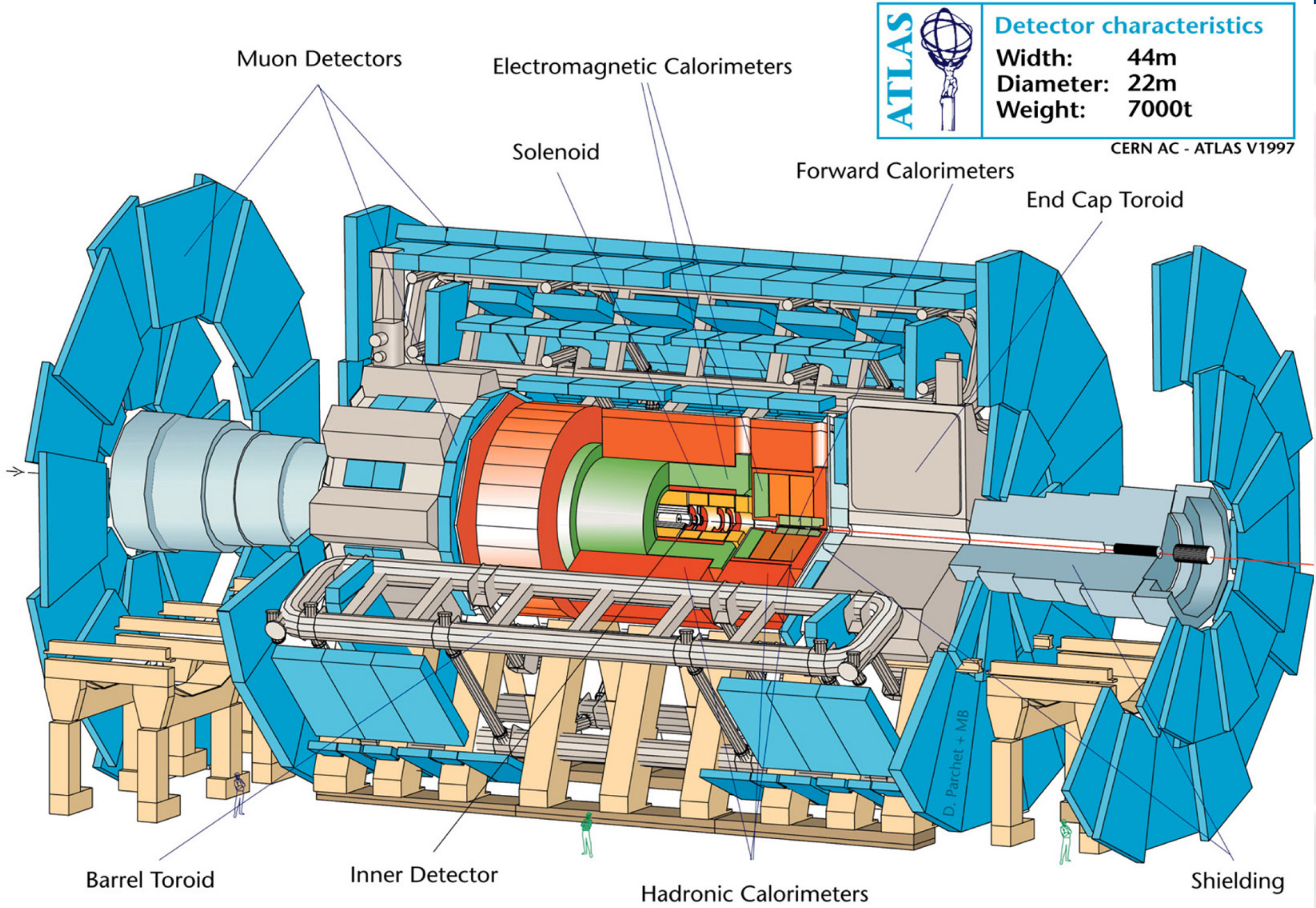
My early introduction to ATLAS was done with some tau-selection optimization studies done in the context of FTK, in collaboration with the Chicago group.

My experience in the DP&DQ group will be of use in the performance studies needed for the upgrades foreseen in the trigger and Tile Calorimeter.

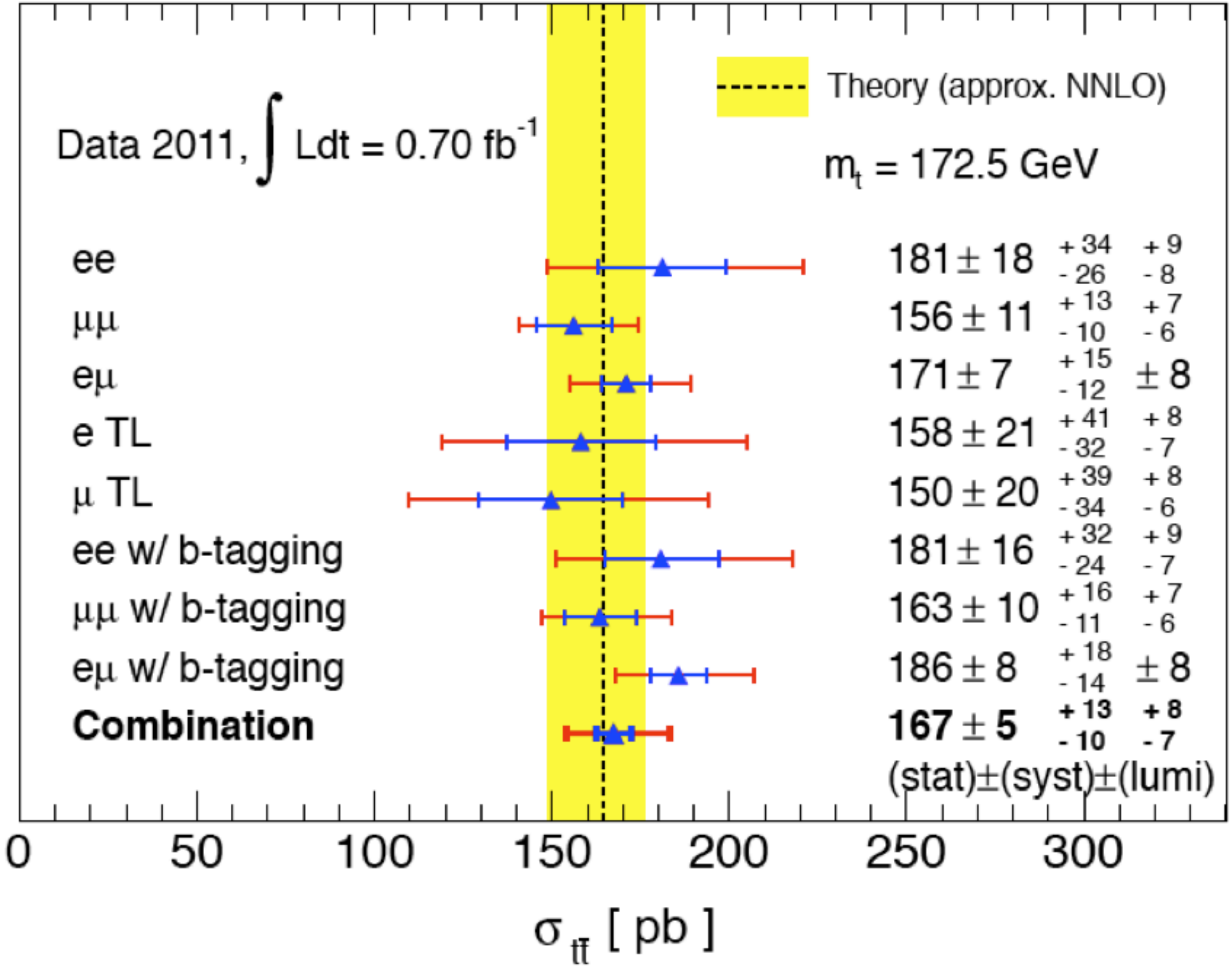

Thank you!

Backup Slides

ATLAS Detector



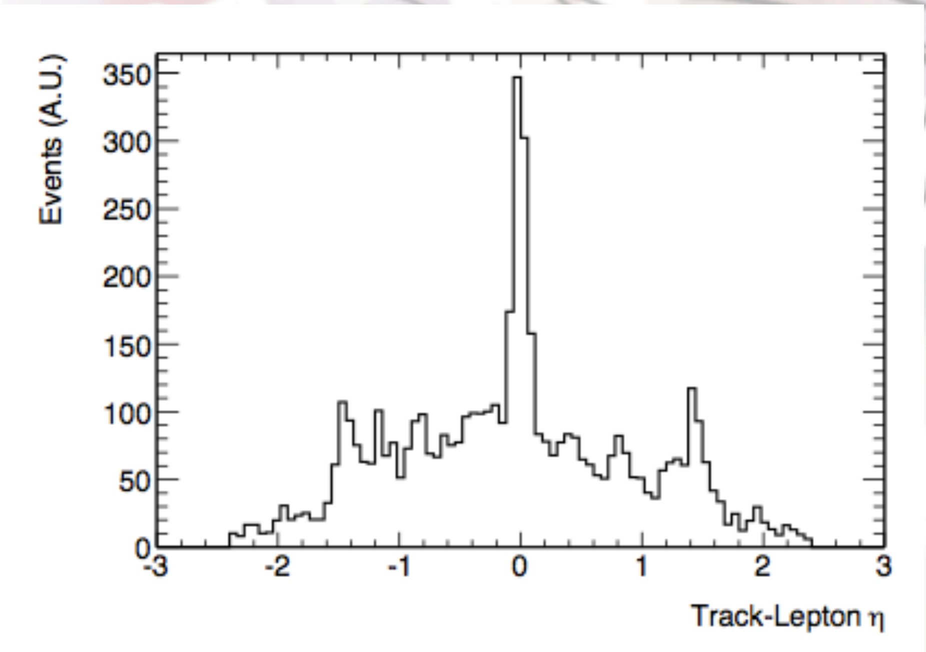
Other Cross Section Results



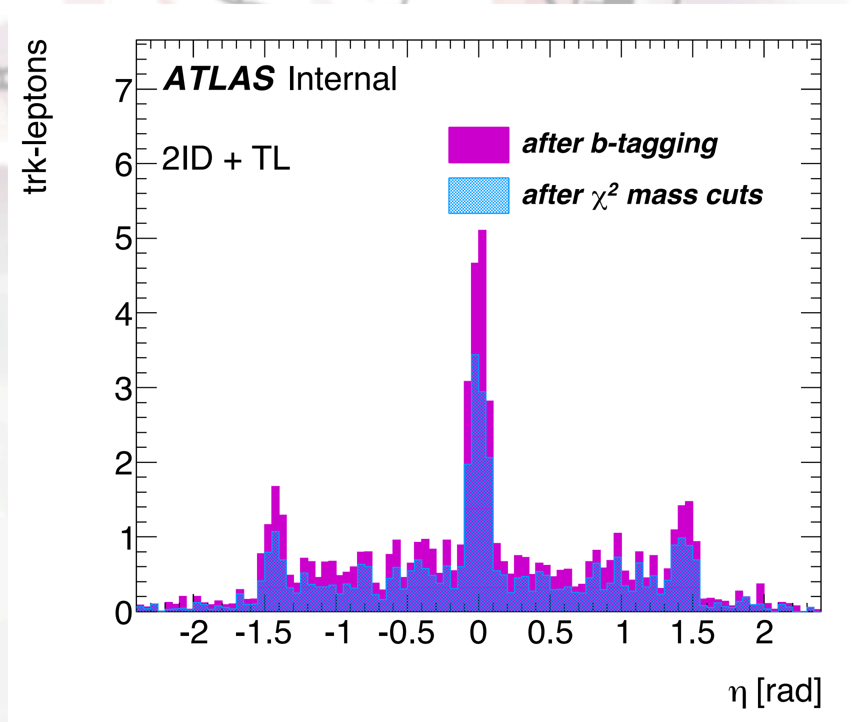
Other FCNC searches

	LEP	HERA	Tevatron	LHC
$\mathrm{BR}(t \to q\gamma)$	2.4% [26–30]	0.64% ($tu\gamma$) [31]	3.2% [32]	—
$\mathrm{BR}(t \to qZ)$	7.8% [26–30]	49% (tuZ) [33]	3.2% [34]	1.1% [24]
$\mathrm{BR}(t \to qg)$	17% [35]	13% [33, 36, 37]	$2.0 \cdot 10^{-4}$ (tug) $3.9 \cdot 10^{-3}$ (tcg) [38]	—

TLs eta



Cross Section



FCNC